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INTELLIGENCE MEMORANDUM NO. 181

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CENTRAL INTELLIGENCE AGENCY

INTELLIGENCE MEMORANDUM NO. 181

Revised
10 February 1950

SUBJECT: Resources and Allocations of Steel, Aluminum, Petroleum, Electric Power, and Technical Manpower for the USSR, 1949-1952

Revision of JIC 435/21 "Soviet Capabilities and Courses of Action, 1952"

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Note: This memorandum has not been coordinated with the intelligence organizations of the Departments of State, Army, Navy, and the Air Force.

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RESOURCES AND ALLOCATIONS OF STEEL, ALUMINUM, PETROLEUM, ELECTRIC POWER, AND TECHNICAL MANPOWER FOR THE USSR, 1949-1952

Revision of JIC 435/21 "Soviet Capabilities and Courses of Action, 1952"

I. INTRODUCTION

The Joint Intelligence Group on behalf of the Joint Intelligence Committee has requested the Central Intelligence Agency to present estimates of the following resources and their allocation to the Soviet military and civilian economies.

1. Steel
2. Aluminum
3. Petroleum
4. Electric Power
5. Technical Manpower

In its approach to this subject CIA estimated total production on the one hand, and allocation to the civilian industrial economy and the military on the other, using all available intelligence information and techniques.

The following economic and political assumptions were set up by the Joint Intelligence Group:

(1) The current rate of production will remain approximately the same.
(2) The trends and patterns of Soviet production, as now known, and aims of the Five-Year Plan should be considered in the problem.
(3) The existing military occupation of Germany, Austria, Trieste, and Japan will still be in effect.

The specific question is asked: "By July 1952, do the Soviets have the capability of having on hand requirements of the above categories for the Army, Navy, and Air Force" as well as for the civilian industrial economy? The corollary to this question is: what, if any, is the surplus or deficit? More specifically the report relates solely to the resources and allocations of steel, aluminum, petroleum, electric power and technical manpower in the USSR for the years 1949 to 1952 inclusive.

ABSTRACT OF CONCLUSIONS

Steel

The total availability, including production and imports is adequate to meet the total requirements for the civilian economy and military, with a surplus 1/ of 2.0 percent (0.5 million tons) for 1949; 3.0 percent (0.77 million tons) for 1950; 10.0 percent (2.7 million metric tons) for 1951; and 16.0 percent (4.4 million metric tons) for 1952. This applies to raw steel, and no consideration is given to special alloys here.

1/ For quantity surplus on steel, aluminum, and petroleum, see III Summary Table.

Petroleum

The total availability, including production and imports, is adequate to meet the total requirements for the civilian economy and military. A surplus of 6.5 percent is estimated for 1949; 3 percent for 1950; 3.8 percent for 1951; and a 1 percent deficit for 1952.

Electric Power

The estimated production of electric power is 73 billion KWH in 1949 and 82.0 and 92.0 and 104 billions for 1950, 1951, and 1952 respectively. Plant capacity of electric power will be adequate to meet all requirements for the military and civilian industrial economy during the years 1949-1952. In this particular item, it is to be emphasized that production never exceeds usage except by normal losses which are inherent in power distribution.

Technical Manpower

The availability of technical manpower for the years 1949-1952 will be adequate to meet all industrial and military requirements. The educational facilities are adequate to fill normal losses by death and retirement.

Atomic Energy

Atomic energy requirements with respect to steel, aluminum, petroleum, and electric power are nominal. For purposes of this report they are included in requirements for industry.

CONCLUSION

THE OUTSTANDING CONCLUSION IN THIS REPORT IS THAT THE RESOURCES OF STEEL, ALUMINUM, PETROLEUM, ELECTRIC POWER, AND TECHNICAL MANPOWER WILL BE ADEQUATE TO MEET "COLD WAR" NEEDS FOR THE MILITARY AND CIVILIAN INDUSTRIAL ECONOMY.

REMARKS

While not strictly within the scope of this report, it is important to point out that the conclusion should not be applied to situations other than "Cold War" conditions.

For example, the data on crude petroleum and its products should not be interpreted as covering war needs of high octane combat aviation gasoline (95 +) which, it is estimated, will still be in short supply by 1952. The supply of this critical material is only 40 percent of the wartime requirement for 1949. The shortage is entirely due to the lack of specialized equipment requiring a high order of technical skill and special materials both for construction and operation. On the other hand, the supply of raw material to make high-grade jet fuel and facilities to produce the same are ample to take care of all military needs even during war. The presently available jet planes to use this fuel, however, represent only a small portion of the total air force requirements.

It is interesting to note that the estimated surplus of approximately 600,000 metric tons of aluminum at the end of 1952 represents double the production and imports of the peak war demands (1944), and apparently is to be largely employed for building planes.

A pool of scientific non-industrial and non-military technical manpower will be available for unusual demands. This statement, however, does not refer to the level of "know-how" or the limitations in specialized fields.

II. SUMMARY AND CONCLUSIONS

STEEL

1. Production of steel in the USSR dropped from a maximum of approximately 18 million metric tons before World War II to a minimum of 6.5 million in 1942, and thereafter rose from the postwar figure of 11.4 million in 1945 to the present production of 20 million. While strenuous efforts have been made to achieve the 1950 goal of 25.4 million metric tons, including restoration of facilities destroyed during the war, as well as intensifying all activities such as processing of scrap metal and building of new facilities, it is certain from all the evidence that this goal will not be met.

2. Projected production estimates for 1950-1952 are based largely on the prewar average annual increase rate, the shorter but more spectacular pattern for 1933-1936, and reported progress in reconstruction and new construction work. The period from 1933-1936 closely parallels that from 1947-1949, and it is assumed that this trend will continue for 1950-1952.

3. Total production for 1949, plus imports, gives a total availability of 22.4 million metric tons, and total requirements for the civilian industrial economy and the military of 21.9 million. The surplus for this year is, therefore, 2.1 percent. In like manner, a surplus of 3.0 percent for 1950; 10.0 percent for 1951; and 16.0 percent for 1952 is indicated.

Estimates for steel requirements with respect to the distribution pattern in the civilian industrial economy is based upon an authoritative Soviet publication on the consumption of steel in the USSR, and on direct estimates of the requirements for Agriculture and Transportation. The total requirement for the civilian industrial economy was then added to the military requirements. The difference between Total Availability, which includes production and imports, and Total Requirements indicates the surplus.

ALUMINUM

1. The aluminum industry in the USSR was practically nonexistent before 1930, but in the succeeding decade had reached a total production of over 78,000 metric tons. The demands of World War II necessitated large imports, which in 1944 exceeded production.

2. Since World War II, the USSR has rapidly overcome the deficit by increasing production to the extent that at present, imports have virtually disappeared. Since World War II, evacuated plants have been reconstructed; others have been expanded, and in addition, seven plants have been reliably reported as under construction, from which it has been deduced that a total production of 210,000 metric tons was produced in 1949. It is estimated that by 1952 this figure will be increased to 300,000 metric tons.

3. The supplies of bauxite, cryolite, and other essential aluminum-producing ores, as well as electric power, electrodes, and plants and production equipment are ample for all of the aluminum needs of the USSR without imports. However, the Satellites may supply substantial quantities of both the ores and the material if conditions warrant.

4. The requirements for aluminum by the civilian industrial economy increased from approximately 25,000 tons per annum before World War II to 72,000 metric tons shortly thereafter (1947), and it is assumed that this increase in consumption will continue at least at the average increased rate of production. Despite the greatly increased consumption of

aluminum as estimated by the data, production has greatly outstripped consumption, pointing to a large surplus or heavy stockpiling.

5. The distribution-consumption pattern of aluminum based on a direct determination of transportation and the US pattern of distribution for Industry and Home Use, is as follows:

Industry	64%
Transportation	24%
Home Use	12%

Total requirements for the civilian industrial economy are, in general, for 1949-1952 approximately 75 percent, and 25 percent for the military.

6. The total estimated surplus available at the end of 1952 will be approximately 600,000 metric tons which, based on a peak wartime requirement in 1944 of approximately 300,000 metric tons, is equivalent to a two-year supply for war purposes, and by July 1952, will fall short only about 12 percent of this amount.

PETROLEUM

1. The rate of production of crude oil at the end of 1949 was approximately 32.8 million metric tons. The average yearly rate of increase since 1945 is about 12 percent or 3.2 million metric tons; i.e., crude oil production in 1945, 1946, 1947, and 1948 was about 19.4, 21.7, 25.8, and 29.2 million metric tons, respectively. On the basis of 12 percent increase for each year, the production for 1950,1951, and 1952 will be 36.7, 41.1, and 46.0 million metric tons respectively.

2. An important aspect of petroleum production is the supply of oil-field equipment. By 1950, this is planned to be 2.5 times the output in 1940, with a considerable increase in the variety of items manufactured. A shortage in fabricated steel in measuring and control instruments, however, will hinder the expansion of oil-production equipment.

3. Soviet refining capacity now exceeds crude-oil output by an estimated minimum of 13 percent (with 40 percent excess based on all available reports of plant listings). The principal equipment shortage in petroleum refining is in specialized types for the production of high octane gasoline, such as catalytic cracking plants, alkylation and polymerization units.

4. Based on indigenous crude-oil production of 32.8 million metric tons in 1949,1950, and 1951, the available refined products, with the exception of high-octane combat aviation gasoline will meet "cold war" needs with a surplus. There will be a small deficit in 1952. These are summarized as follows:

	1949	1950	1951	1952
% Surplus	2.0	1.0	1.4	
% Deficit				0.5

Any shortages based on indigenous production can more than be made up by imports and synthetic production.

5. Because adequate specialized equipment, such as catalytic cracking plants, alkylation and polymerisation units, is decidedly lacking, production of this critical commodity, which is so necessary in an air age,

lags far behind requirements. It appears from the available information that the USSR can produce only 35-50 percent of its high octane combat aviation gasoline requirements (approximately 2.5 million metric tons) for minimum Air Force operations.

An additional estimated 1,500,000 metric tons of 75-85 octane gasoline, which has been employed as aviation fuel in the USSR, can be made available. This latter grade, however, being unsuitable for combat purposes, was generally employed for transport and low-flying ground support and attack.

Tetraethyl lead, perhaps the most important component of high octane gasoline, to improve its anti-knock value, is made at the Oka and Kalinin plants in Dzerhinsk, and the Olginsky plant in Moscow. No other producing areas for this highly critical material are known. (Tetraethyl lead is a vital material for the production of combat aviation gasoline because of the relatively small amount required to produce a very large increase in the octane rating and the efficiency and maneuverability of the plane.)

6. Ample jet fuel production facilities are available along with sufficient crude oil supplies to satisfy requirements for Air Force operations, provided there are sufficient and satisfactory jet-propelled aircraft. The availability of jet fuel is limited primarily by composition of the crude oil. This fuel consists generally of naptha, kerosene, and light gas oil, or a mixture of any of them.

Widely scattered storage facilities point to serious attention by the Soviet planners in this direction. Based on present planning, however, high octane combat aviation gasoline is in short supply, and the amount of jet fuel required is at present small, indicating that the program for jet plane production has been only partly developed.

7. Existing centers of synthetic fuel production, namely, prewar experimental plants in the Kuzbas and near Lake Baikal, have been expanded by the additions of dismantled German plants and the construction of new plants. Recent reports indicate there are now five plants in the Kuzbas region, two in the Trans-Baikal, two in the Ukraine, and one in the Urals. The center of activity is apparently localized in areas which are distant from petroleum-producing regions but which have suitable coal deposits for use as raw material. In addition, there are other plants outside the USSR, the products of which would be available. The total estimated synthetic oil production is one million metric tons, although the plant capacities in the USSR and Satellites are several times this figure. The octane value of synthetic gasoline is generally low. It will be used as aviation gasoline only when no other product is available.

ELECTRIC POWER

1. According to the provisions of the Fourth Five-Year Plan covering the period from 1946-1950, the capacity of electric generating plants in the USSR (48.2 billion KWH in 1940) was to be more than doubled (109 percent increase), and the electric power output was to be increased by 70 percent. This planned increase of capacity over output indicates the desire of the Soviets to provide a greater standby or reserve capacity.

Total estimated production of electric power was 73 billion KWH in 1949, and it is estimated it will be 82 billions in 1950; 92 billions in 1951; and 104 billions in 1952. This represents a rate of increase for 1949 and 1950 of 13.5 percent over each preceding year, and of 12.5 percent for 1951 and 1952 over each preceding year. These results are of the same order as those for the gross industrial output.

The estimated production at plant capacity of electric power generally will be adequate to meet all requirements, both for the military and civilian industrial economy for the years 1949-1952.

2. With respect to requirements for electric power, it is to be emphasized that production never exceeds usage except by normal losses which are inherent in power distribution.

TECHNICAL MANPOWER

1. The total technical manpower requirements for the industrial economy with middle and higher education is estimated to be 1.9 million for 1949; 2.1 million for 1950; 2.3 million for 1951; and 2.5 million for 1952. These requirements for industry and the military can be fully met by the technical manpower available. While no quantitative data have been obtained on facilities for training, based on the allocation data for the past, the educational facilities are adequate to fill normal losses by death and retirement. In addition, the scientific non-industrial and non-military pool can apparently meet unusual demands. It is to be emphasized that this statement does not refer to the level of "know-how" or the limitations in specialized fields.

ATOMIC ENERGY

Atomic energy requirements, with respect to steel, aluminum, petroleum, and electric power and technical manpower are nominal when compared to the requirements for the over-all civilian industrial economy and the military. For purposes of this report, they are included in requirements for industry.

Remarks

(a) It is to be noted that the military requirements for steel, aluminum, petroleum, electric power, and technical manpower for the USSR have been prepared by the Department of the Navy (ONI), War Department, General Staff (ID), and Air Force (Air Intelligence), and have been incorporated herein. The detailed reports are in the Appendix.

(b) The data for 1 July 1952 are based on one-half the total for 1952 as a whole and as such are considered sufficiently accurate.

(c) All IAC and other agencies were consulted in the compilation of this report.

Resources and Allocations of Steel, Aluminum, Petroleum, Electric Power and ...
Revised, 26 January 1950

Requirements	1948					1950					
	1. Steel (Raw)	2. Aluminum	3. Refined Petroleum Products	4. Electric Power	5. Technical Manpower	1. Steel (Raw)	2. Aluminum	3. Refined Petroleum Products	4. Electric Power	5. Technical Manpower	1. Steel (Raw)
	Metric tons	*Metric tons*	*Metric tons*	*Billion KWH*	*Middle & Higher Education*	*Metric tons*	*Metric tons*	*Metric tons*	*Billion KWH*	*Middle & Higher Education*	*Metric tons*
I Agriculture (total)	1,312,200		6,000,000	2.19	522,000	1,493,200		6,500,000	2.80	565,000	1,727,000
Tractors	423,000					487,800					567,600
General Equipment	889,200					1,005,400					1,159,400
II Transportation (total)	6,484,505	17,339	9,300,000	1.96	259,600	8,032,787	21,750	11,700,000	2.50	280,700	7,914,128
Railroads	4,708,405		3,100,000			5,808,987		3,100,000			5,347,828
Motor	1,135,300		4,400,000			1,555,700		6,800,000			1,976,100
Inland Water	462,400		300,000			480,200		300,000			445,700
Pipelines	105,400					114,900					70,100
Civil Air	6,500					6,500					7,900
Shipping (Merchant Marine)	66,500		1,500,000			66,500		1,500,000			66,500
III Industry[1]	11,100,900	58,000	6,700,000	51.76	1,111,000	12,490,000	65,000	7,900,000	58.0	1,224,000	13,870,000
IV Home Use	629,600	10,900	3,100,000	6.93		710,200	12,300	3,100,000	7.5		786,700
V Military (Total)	2,394,759	30,629	4,842,348		15,500	2,464,379	31,523	5,118,316		15,500	2,593,190
Army (Ground Force Weapons)	1,007,000	3,300	1,423,200		[3] 6,000	1,007,000	3,300	1,455,000		[3] 6,000	1,007,000
Air Force	93,186	25,381	747,000		[3] 5,000	94,017	25,792	747,000		[3] 5,000	96,011
Navy	137,573	948	2,672,148		[3] 4,500	206,362	1,431	2,916,310		[3] 4,500	330,179
Miscellaneous weapons, ammunition—Ground and Air Force	[6] 1,157,000	[6] 1,000				1,157,000	[6] 1,000				[6] 1,160,000
VI Total Requirements	21,921,964	116,868	29,942,348	62.84	1,908,100	25,190,566	120,573	34,318,316	70.80	2,085,200	26,891,018
VII Production[2]	21,600,000	210,000	28,600,000	72.90		25,100,000	240,000	31,800,000	82.0		28,600,000
VIII Imports	780,937	5,000	[2] 3,300,000			884,568	3,000	[2] 3,500,000			999,527
IX Total Availability	22,380,937	215,000	31,900,000	72.90	1,908,100	25,984,568	243,000	35,300,000	82.0	2,085,200	29,599,527
X Surplus	458,973	98,132	1,957,652	(5)	(4)	974,002	112,427	1,018,316	(5)	(4)	2,708,409
XI Deficit											

[1] Includes Atomic Energy Requirements.
[2] Includes Indigenous Synthetic Petroleum.
[3] The requirement for 1949 is static and there is consequently no additional need for 1950-1952.
[4] Requirements shown also indicate supply facilities for training as well as non-military and non-industrial scientific pool are estimated to be sufficient to meet requirements from year to year.
[5] Production minus normal losses are equal to requirements.
[6] Does not include Army estimates of Air Force weapons in Chart II.

Technical Manpower—USSR 1949–1952

	1951					1952				
	1. Steel (Raw)	2. Aluminum	3. Refined Petroleum Products	4. Electric Power	5. Technical Manpower	1. Steel (Raw)	2. Aluminum	3. Refined Petroleum Products	4. Electric Power	5. Technical Manpower
her	*Metric tons*	*Metric tons*	*Metric tons*	*Billion KWH*	*Middle & Higher Education*	*Metric tons*	*Metric tons*	*Metric tons*	*Billion KWH*	*Middle & Higher Education*
	1,727,000		7,000,000	3.23	608,000	1, 927,000		7,800,000	3.53	656,000
	567,600					651,300				
	1,159,400					1,275,700				
	7,914,128	27,135	13,612,000	3.46	301,800	8,046,509	27,066	17,312,000	4.43	323,500
	5,347,828		3,100,000			5,351,709		3,100,000		
	1,976,100		8,700,000			1,976,100		12,400,000		
	445,700		300,000			578,100		300,000		
	70,100					66,200				
	7,900					7,900				
	66,500		1,512,000			66,500		1,512,000		
	13,870,000	72,600	8,800,000	64.77	1,350,000	15,260,000	81,500	10,100,000	72.56	1,482,000
	786,700	13,800	3,200,000	8.39		850,200	15,500	3,200,000	9.33	
	2,593,190	33,394	5,541,476		15,500	2,316,514	36,559	6,042,723		15,500
	1,007,000	3,300	1,493,700		[3] 6,000	1,007,000	3,300	1,523,400		[3] 6,000
	96,011	26,800	747,000		[3] 5,000	99,215	28,451	747,000		[3] 5,000
	330,179	2,289	3,300,776		[3] 4,500	550,299	3,799	3,772,323		[3] 4,500
	[6] 1,160,000	[6] 1,005				[6] 1,160,000	[6] 1,009			
	26,891,018	146,929	38,153,476	79.85	2,275,300	28,900,223	160,625	44,454,723	89.85	2,477,000
	28,600,000	275,000	35,800,000	92.2		32,100,000	300,000	40,000,000	103.7	
	999,527		[3] 3,800,000			1,162,950		[3] 4,000,000		
	29,599,527	275,000	39,600,000	92.2	2,275,300	33,262,950	300,000	44,000,000	103.70	2,477,000
	2,708,409	128,071	1,446,524	(5)	(4)	4, 362,727	139,375		(5)	(4)
								454,723		

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IV. STEEL

The production of steel in the USSR dropped from a maximum of approximately 18 million metric tons before World War II to a minimum of 6.5 million in 1942, and thereafter rose from the postwar figure of 11.4 million in 1945 to an estimated production of 21.6 million for 1949. Strenuous efforts are being made to achieve the 1950 goal of 25.4 million, including the restoration of facilities destroyed during the war and intensification of all activities, such as completion of reconstruction by 1949; processing of scrap metal, and the building of new plants. The attempt will fall only a little short of accomplishment.

Table 1 shows the progress of the steel industry in the USSR from 1928 to 1952. It is believed that progress of the industry in the postwar years closely parallels the prewar steel production for 1933-1936. The production figures for 1928-1940 are based on many publications and official Soviet claims. 1/ The figures from 1942-1948 were calculated, 1945 being taken as the base year. These data were inadvertently revealed in a Soviet publication "Ferrous Metallurgy in the New Five-Year Plan" by I. P. Bardin and N. P. Bannyi (Institute of Metallurgy, 1947, Moscow). Soviet Gosplan reports on percentage fulfillment of steel production were also used in the calculation.

In computing the 1945 production, the following statement by Bardin and Bannyi was of particular interest:

"The tempo of growth of ferrous metallurgy in the Fourth Five-Year Plan and the scale of work markedly surpasses the tempo and scale of the First, Second, and Third Five-Year Plans. In the First Five-Year Plan, the general increase in the production of pig iron amounted to 2.9 million tons and for steel, 1.7 million tons. In the Second Five-Year Plan it was correspondingly 8.3 and 11.8 million tons; according to the plan for the Third Five-Year Plan, the completion of which was prevented by the war, production was to increase 7.5 and 10.4 million tons. The increase in production of metal in the Fourth Five-Year Plan will be even greater. Comparative scales for growth of production of ferrous metallurgy are characterized by the following figures: In the First Five-Year Plan, the average yearly increase in pig iron production was 0.7 million tons, and for steel 0.4 million tons. In the Second Five-Year Plan the average annual increases were 1.7 million tons of pig iron and 2.4 million for steel. The scale of growth of production of pig iron in the Fourth Five-Year Plan is planned at approximately 1.2 times greater than in the Second Five-Year Plan, and 3.0 times greater than in the first; for steel, the corresponding figures are 1.2 times and 7 times greater respectively." From these data it is deduced that the average rate of production for the Fourth Five-Year Plan are 2.8 and 2.88, respectively. Therefore, 25.4 (1950 plan goal) - (2.88 x 5) = 11.4 million metric tons for 1945. This estimate for 1945 production is also borne out in the latest official Soviet publication. 2/

From the above, together with Gosplan Reports, the following production data were deduced:

Average yearly increase 1946-1950 — 2.88 million tons of steel
Total new steel for Fourth Five-Year Plan — 14.4 million tons
1950 goal for steel — 25.4 million tons
1945 production of steel — 11.0 - 11.4 million tons
1946 production (9 percent increase over 1945) — 12.4 million tons

1/ Soviet technical documents and Soviet and US publications, e.g., Stal, Bolshevik, Gosplan Reports, Yugow, Baykov, etc.
2/ USSR Information Bulletin, 12 August 1949.

1947 production 9 percent increase over 1946 -- 13.5 million tons
1948 production 28 percent increase over 1947 — 17.3 million tons
1949 production 25 percent increase over 1948 — 21.6 million tons

The 1949 production is based on published Gosplan reports applied to previous estimates. Production for 1950 to 1952 inclusive is based on the average increase in production for 1933 to 1936 and 1947 to 1949. 1/

The 1950-1952 steel production estimates are based largely on the prewar average annual increase pattern; the shorter but more spectacular pattern from 1933-1936; and reported progress in reconstruction and new construction work. The period from 1933-1936 closely parallels the period from 1947-1949 and it is assumed that the period 1950-1952 will continue substantially in the same manner, with some leveling off as a result of completion of reconstruction.

In the period 1933-1936 most of the steel-making equipment was built in foreign countries and the installation of this equipment was supervised by foreign experts. These two factors made possible the rapid increase in steel-making capacity. The remarkable assumed rate of increase during the period 1947-1949, resulted primarily from the relative ease of reconstruction as compared with totally new construction; the installation of steel-making equipment obtained from occupied countries; and assistance in supervision of installations and repair by German experts. Reports indicate that the bulk of reconstruction has been completed in 1949. The rate of increase of average annual steel capacity, therefore, should be at a decreasing level in the immediate succeeding years.

Table 1

STEEL PRODUCTION IN THE USSR 1928-1952
(Millions of Metric Tons) 2/

1928	4.3
1929	4.7
1930	5.8
1931	5.6
1932	5.9
1933	6.8
1934	9.7
1935	12.6
1936	16.2
1937	17.7
1938	18.0
1939	17.6
1940	18.3
1941	16.7
1942	6.5
1943	7.7
1944	9.9
1945	11.4
1946	12.4
1947	13.5
1948	17.3
1949	21.6
1950	25.1
1951	28.6
25X1X7 1952	32.1

1/ [redacted] PW reports, defectees, US industrialists and other sources.

2/ Summarizes all the data obtained in the above manner and is fairly well in agreement with figures obtained by integration of individual plant production. The data through 1948 are in agreement with those accepted by State Dept., ID, and A-2.

Estimated steel requirements by the principal categories of the Civilian economy are shown for the years 1949-1952 in Table 2. The estimates for steel requirements by agriculture and transportation were obtained through methods described below. Those for Industry and Home Use are based on a prewar pattern outlined in a Soviet publication by Shulkin 1/ (1940) entitled "Consumption of Ferrous Metals in the USSR."

Agriculture

The estimated steel consumption by agriculture was calculated as follows: (1) The total number of tractors to be produced from 1949-1952, the numbers of each type to be produced, and the relative weights of each type were determined from known data. (2) From this the total net weight of all tractors for each year was obtained. (3) In addition a waste factor plus spare parts required were calculated according to US standards, with allowances made for Soviet practices. The US factor, giving the percentage of the above total in terms of rolled steel, was then applied, and this was converted to raw steel employing a factor of 72 percent.

Requirements of rolled steel for agricultural equipment (including such items as combines, threshers, plows, harrows, etc.) was based on the prewar pattern of consumption. Average annual rolled steel requirements for agricultural equipment for the years 1934-1938 were obtained from Shulkin's publication 1/ and scaled down in accordance with estimated non-fulfillment of the plan. Raw steel requirements were then obtained on the same basis from rolled steel as for tractors.

Transportation

The estimated requirement of steel by the Soviet transportation industry was determined by the application of various US and USSR factors to the manufacture and repair of transportation equipment for the period 1949-1952. Anticipated production and use of steel for railroads and inland waterways was based on requirements indicated by anticipated increases in traffic.

It was concluded that planned traffic would be achieved in 1950, and estimates for 1949 were made accordingly. Traffic increases in 1951 and 1952 were based upon the assumption of a direct relationship between traffic and the index of gross industrial output. The latter was estimated to show an increase of 12 and 13 percent in 1951 and 1952 respectively (over 1950) and traffic was projected proportionately.

Motor vehicle production, and steel requirements for the same were estimated on the basis of past performance and continued production according to plan. In this connection, traffic increases indicated by the index of gross industrial output necessitate unrealistic cutbacks in production; hence past performance appeared more reliable. Similarly, estimates of pipeline construction were based on the completion of current construction by the end of 1950 and the assumption of a continued consistent rate of construction in 1951 and 1952. Civil aircraft production was based on the maintenance of a constant inventory 2/ of some 3,400 aircraft in each of the four years with steel requirements increasing in 1951 and 1952 because of the anticipated emphasis in production on larger type aircraft. In the case of ocean-going ships, it was estimated that production would amount to 25,000 gross tons in each of the four years.

1/ Shulkin, L. R., Potreblenie Chernykh Metallov v SSSR, Moskva, 1940.
2/ See appendix.

With the exception of motor vehicles and inland waterway vessels, factors of steel consumption per unit of production were derived from data based on United States experience. Soviet factors were used in connection with motor vehicle and vessel requirements. Steel consumption in railroad bridge restoration and construction was accepted as specified in the current Five-Year Plan and projected at the planned rate into 1951 and 1952.

As a check on raw steel consumption by agriculture and transportation as calculated above, independent computations were made from the data of Shulkin, and the totals obtained by the two different methods of calculation were reasonably close, thus further substantiating both methods.

The requirement for Steel consumption by Industry and Home Use shown in Table 2 was calculated on the basis of the prewar consumption pattern as established by Shulkin. From all appearances, practically all reliable sources of information on steel requirements in the USSR are based largely on the Shulkin publication. The conclusion is made on the basis of independent analyses of the data of Shulkin and those of the secondary sources.

Analysis of the prewar consumption pattern in the USSR indicated that the 1938 pattern was representative. This pattern was therefore extrapolated for Industry and Home Use (for Agriculture and Transportation as a cross check) for the years 1949-1952 and the rate of production increase employed to obtain the total consumption.

The detailed requirements for Agriculture and Transportation and method of obtaining them is shown in the Appendix.

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Table 2

RAW STEEL CONSUMPTION IN USSR
(Thousands of Metric Tons)

	1949	1950	1951	1952
Agriculture...Total...	1312.2	1493.2	1727.0	1927.0
Tractors...	423.0	487.8	567.6	651.3
Agric. Equipment 1/	889.2	1005.4	1159.4	1275.7
Transportation...Total...	6484.5	8032.7	7914.1	8046.5
Railroads...	4708.4	5808.9	5347.8	5351.7
Motor Transport...	1135.3	1555.7	1976.1	1976.1
Inland Waterways...	462.4	480.2	445.7	578.1
Pipe Lines...	105.4	114.9	70.1	66.2
Civil Aviation...	6.5	6.5	7.9	7.9
Shipping...	66.5	66.5	66.5	66.5
Industry...Total...2/	11,100.9	12,490.0	13,870.0	15,260.0
Home Uses...Total...3/	629.6	710.2	786.7	850.2

1/ Including mostly machine equipment such as combines, tractor cultivators, plows, seeders, etc., plus miscellaneous small steel items such as scythes, sickles, one-horse plows, etc.

2/ Total includes the following seven categories:
Ferrous metallurgy. (incl. mining and coke)
Fuels. (incl. coal, oil and peat)
Construction. (not incl. rail for track construction - incl. under railway transport)
Heavy machine building.
Other machine building. (incl. electric, light and medium machine building, machine tool instrument, diesel production, etc.)
Other heavy industry. (incl. non-ferrous metallurgy, chemical industry, electro-stations, etc.)
Local industry.

3/ Total includes the following seven categories:
Light industry.
Forestry.
Food industry.
Trade.
Communications.
Business co-operatives.
Other uses.

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Table 3

SUMMARY

RESOURCES AND ALLOCATION OF STEEL USSR
(Metric Tons)

REQUIREMENTS	1949	1950	1951	1952
I AGRICULTURE (total)	1,312,200	1,493,200	1,727,000	1,927,000
Tractors	423,000	487,800	567,600	651,300
General Equipment	889,200	1,005,400	1,159,400	1,275,700
II TRANSPORTATION 3/ (total)	6,484,505	8,032,787	7,914,128	8,046,509
Railroads	4,708,405	5,808,987	5,347,828	5,351,709
Motor	1,135,300	1,555,700	1,976,100	1,976,100
Inland Water	462,400	480,200	445,700	578,100
Pipe Lines	105,400	114,900	70,100	66,200
Civil Air	6,500	6,500	7,900	7,900
Shipping (Merchant Marine)	66,500	66,500	66,500	66,500
III INDUSTRY 1/	11,100,900	12,490,000	13,870,000	15,260,000
IV HOME USE	629,600	710,200	786,700	850,200
V MILITARY (total)	2,394,759	2,464,379	2,593,190	2,816,514
Army (Ground force weapons)	1,007,000	1,007,000	1,007,000	1,007,000
Air Force	93,186	94,017	96,011	99,215
Navy	137,573	206,362	330,179 6/	550,299 6/
Misc. Air Force Weapons, ammunition, Ground and Air Force	1,157,000 6/	1,157,000	1,160,000	7,160,000
VI TOTAL REQUIREMENTS	21,921,964	25,190,566	26,891,018	28,900,223
VII PRODUCTION 2/	21,600,000	25,100,000	28,600,000	32,100,000
VIII IMPORTS	780,937	884,568	999,527	1,162,950
IX TOTAL AVAILABILITY	22,380,937	25,984,568	29,599,527	33,262,950
X SURPLUS	458,973	974,002	2,708,409	4,362,727

1/ Includes Atomic Energy Requirements
2/ Includes Indigenous Synthetic Petroleum
3/ Slight increase only contemplated in total gross tonnage of Merchant Marine; and total oil consuming locomotives remains substantially constant
6/ Does not include army estimates of Air Force weapons in Chart II

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Note: Items 2 - 6 inclusive are known to be based on item 1 by Shulkin.

V. ALUMINUM

Development of the aluminum industry, which was practically non-existent before 1930, progressed rapidly during the first two Five-Year Plans, and by 1940 production had reached a total of over 78,000 metric tons. In World War II, the greatly increased demand necessitated large imports which in 1944 exceeded production despite the rapid growth of the latter.

Since the war, this deficit has been overcome by rapidly increased production so that the need for imports has virtually disappeared. Since World War II, evacuated plants have been reconstructed and others have been expanded; in addition, seven plants have been reliably reported as under construction. One of the significant features of the aluminum industry may be seen in the fact that in the postwar years, the surplus available for stockpiling has been almost equivalent to the requirements by civilian industrial economy in addition to the peacetime military requirements.

As elsewhere, bauxite is the principal source of aluminum. There are large deposits of this ore in the Northern and Central Urals, and additional deposits have been reported in Eastern Siberia. The proved deposits of bauxite probably exceed those found in the US, with equivalent probable deposits in the USSR which have not been thoroughly confirmed.

Until the discovery and development of the large bauxite deposits in the Northern Urals, the Soviets used the low-grade bauxites of Boksitogorsk near Tikhvin, in Leningrad Province which were also difficult to treat. Extensive research on the large nephelite deposits of the Kola Peninsula showed these could also be used for producing alumina. At the Zaporazhe Aluminum Plant, it was found possible to use high alumina slags from the blast furnaces, together with Ural bauxites, and this practice was initiated before the war. At Yerevan, in the Caucasus, where an aluminum plant is being constructed, it is proposed to use the high-grade alunites of that region to produce alumina. At the Stalinsk plant in the Altai Region, it was intended to use alumina from Kamensk in the Urals. However, large high grade deposits of bauxite were discovered in the Berd Region of the Altai in 1944. Undoubtedly, an alumina plant will be, or has been constructed at Stalinsk or Kemerovo to save the long haul from the Urals.

In addition to supplies of bauxite, cryolite or artificial cryolite is necessary for the production of aluminum. The latter is made from fluorspar; cryolite is usually produced at or near the aluminum plants. The principal fluorspar producing region is at Amderma, north of the Arctic Circle; and because of transportation difficulties more conveniently located deposits are being developed. The items needed for the production of aluminum, in addition to bauxite or other aluminum-containing minerals such as clays, shales, and other less important aluminum ores and cryolite are a large supply of electrical power and electrodes and the necessary plants and equipment for production.

Tables 1 and 2 show plants which have been constructed or on which reconstruction has been fairly definitely established together with the estimated alumina and aluminum capacities for 1949.

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Table 1

ALUMINA AND ALUMINUM PLANTS (1949)
(Capacity in Metric Tons)

				Alumina 1/ Capacity	Aluminum Capacity
Volkhovstroi	Leningrad	Volkhovstroi Alyumini Zavod	Kirov	30,000 2/	10,000
Kamensk Uralski	Sverdlovsk	Uralski Alyuminevy Zavod	UAZ	200,000	75,000
Krasnoturyinsk	"	Bogoslovski " "	BAZ	100,000	40,000
Stalinsk	Kemerovo	Stalinsk " "	STAZ		20,000

Table 2

PLANTS WHICH ARE REPORTED UNDER CONSTRUCTION

Boksitogorsk	Leningrad			50,000	
Kandalaksha	Murmansk		KAS	5/	10,000
Zaporozhe	Ukraine	Dneprovski Alyuminievy Zavod	DAZ	120,000 3/	57,000 4/
Kanaker	Armenia		KANAZ	5/	30,000
Kizel	Molotov			5/	21,000
Tashkent	Uzbek			5/	30,000
Kemerovo	Kemerovo			5/	26,000

1/ Largely estimated.
2/ Probably considerable nephelite from Kirovsk used to produce alumina.
3/ Bauxite from Hungary. Capacity based on aluminum production.
4/ Prewar production capacity.
5/ Not available.

If additional bauxite were needed in addition to indigenous production, it could be obtained from Hungary.

With regard to aluminum production in the Satellites, Hungary had a production of approximately 11,000 metric tons in 1948, of which about 40 percent was exported, mainly to the USSR. Production in the other Satellite countries is nominal, and while there are plans for increased production, it is believed that imports will not be necessary so far as the USSR economy is concerned, even though Soviet aluminum production in 1948 was only one-third of US production.

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Table 3

ALUMINUM PRODUCTION AND IMPORTS
(In Metric Tons)

Year	Primary	Secondary	Total	Imports	Total Supply
1931			100 1/	15,557 2/	15,657 2/
1932			400 4/	15,027 3/	15,427 3/
1933			4,000 4/	10,000 3/	14,000 3/
1934			14,400 4/	5,238 3/	19,636 3/
1935			25,000 4/	254 3/	25,254 3/
1936			37,000 4/	100 1/	37,100 1/
1937	37,700 1/	9,100 1/	46,800 1/	2,500 1/	49,300 1/
1938	43,800 1/	13,000 1/	56,800 1/	11,900 1/	68,700 1/
1939	49,000 1/	14,700 1/	63,700 1/	3,600 1/	67,300 1/
1940	59,900 1/	18,300 1/	78,200 1/	2,100 1/	80,300 1/
1941	66,400 1/	19,800 1/	86,200 1/	15,200 1/	101,400 1/
1942	57,000 1/	17,100 1/	74,100 1/	63,500 1/	137,600 1/
1943	62,300 1/	31,000 1/	93,300 1/	72,100 1/	165,400 1/
1944	72,000 1/	58,000 1/	130,000 1/	166,300 1/	296,300 1/
1945	86,400 1/	49,000 1/	135,400 1/	12,000 1/	147,400 1/
1946	111,800 1/	61,100 1/	172,900 1/	15,000 1/	187,900 1/
1947	105,000 5/	45,000 5/	150,000 5/	15,000 1/	165,000 6/
1948	125,000 5/	65,000 5/	190,000 5/	10,000 7/	200,000 6/
1949	145,000 6/	65,000 6/	210,000 6/	5,000 7/	215,000 6/
1950	170,000 6/	70,000 6/	240,000 6/	3,000 7/	243,000 6/
1951	200,000 6/	75,000 6/	275,000 6/	---	275,000 6/
1952	225,000 6/	75,000 6/	300,000 6/	---	300,000 6/

1/ SID-3/1/48
2/ Imports 1931 - Prospects for the Economy of Non-Ferrous Metals - Levitin, Sumoy Lovich Deregey, Page 8.
3/ Imports 1932-1935 - Data of the Division of Funds of the People's Comisariat of Heavy Industry.
4/ Production 1932-1936 - Reports of the Main Administration of Aluminum.
5/ [redacted]
6/ Estimate based on completion of projected aluminum plants and power plants.
7/ Based on reports and estimates.

25X1X7

Table 3 shows the yearly production of aluminum from 1931-1952, the data from 1949-1952 being estimated on the basis of completion of projected aluminum plants and power plants required. Imports for these years are likewise shown. During the World War II years, 1941-1944, imports were very large, and in 1944 exceeded production, decreasing steadily thereafter as production increased in the postwar years.

Previous estimates made for requirements for the civilian economy range from 25,000 to 72,000 tons per year 1/ in 1947. The latter figure appears reasonable in view of the known production of 150,000 tons for the same year, and the greatly reduced direct requirement for peacetime military purposes. Furthermore, it has been estimated that the prewar consumption for non-military purposes was a maximum of 25,000 tons per annum, 2/ with a total maximum consumption, including civilian and military, in 1938 of 55,000 tons, 3/ leaving a military consumption of less than 30,000 tons, which likewise is reasonable.

Despite the greatly increased consumption of aluminum as estimated by these figures, and new uses for it in the civilian economy, production has greatly outstripped consumption, pointing to a large surplus or heavy stockpiling. With regard to the distribution pattern of aluminum in the civilian economy of the USSR, a comparison of data published in 1934 4/ shows sufficient similarity in its major categories to relate its latest distribution pattern to uses in the US. This is shown on a percentage basis in Table 4.

Table 4

INDUSTRY		PERCENT
Electrical Conductor and Cables		25
Machinery and Electrical Apparatus		10
Building Construction		10
Ferrous and Non-Ferrous Metallurgy		5
Chemical Industry		3
	TOTAL	53
Transportation		20
Home Use (Cooking and Household Wares)		10
Miscellaneous		17
	TOTAL	100

The direct determination of the use of aluminum in transportation in the USSR was made and is shown in Table 5. The method for determining transportation requirements is shown in the appendix. The use of aluminum in agriculture is less than one percent so that the distribution of the miscellaneous item shown in Table 4 between Industry and Home Use, in proportion to the relative percentage used by each, shows a final distribution or use pattern as follows:

Industry	64%
Transportation	24
Home Use	12

1/ Strategic Vulnerability of the USSR I.D. Phase 2, Report A-2
2/ O.I.R. Report 4639, 25 February 1948, Department of State
3/ Source, IX-116-17 Box 1415 (G.M.D.S. Document)
4/ S.D.S. Special translation — 7 February 1947 Metallgesellshaft A.G. Economic Division, Frankfurt, June 16, 1941

The following method was employed in calculating the total amounts of aluminum consumed by the civilian industrial economy for 1949. Starting with 72,000 metric tons as a base figure for 1947, the rate of increase of production was taken as the probable rate of increase of consumption for increases from 1947-1948 and from 1948-1952. The average rate of increase of production of 12 percent was used as the requirement rate for 1949-1952. (This average rate of increase was incidentally approximately the same as the average gross industrial output for the same period, based on an extrapolation of previous years.)

Table 5 shows the total civilian consumption as estimated above from the years 1949-1952, inclusive, the total military requirements and the grand totals, the former being about 75 percent of the total requirements, and the latter about 25 percent. Table 6 shows the surplus resulting from the total average, arrived at by adding the imports to production and subtracting from that the total requirements both for the military peacetime use and civilian economy.

The total estimated surplus for 1949-1952, inclusive, is 478,005 metric tons, and on the reasonable assumption of 100,000 metric tons total requirements for 1946 and for 1947, this would be increased to a stockpile of approximately 630,905 metric tons by 1952. This includes the carry-over of 152,900 from 1946 and 1947. In view of the peak wartime requirement in 1944 of approximately 300,000 metric tons, this is equivalent to about two years' supply for war purposes in 1952.

Table 5

ALUMINUM REQUIREMENTS USSR
(Metric Tons)

	1949	1950	1951	1952
Agriculture	1/	1/	1/	1/
Industry	58,000	65,000	72,600	81,500
Transportation	17,339	21,750	27,135	27,066
Home Use	10,900	12,300	13,800	15,500
Total	82,639	99,050	113,535	124,066
Military (Total)	30,629	31,523	33,394	36,559
Army	3,300	3,300	3,300	3,300
Air Force	25,381	25,792	26,800	28,451
Navy	948	1,431	2,289	3,799
Miscellaneous: Weapons, Ammunition - Ground and Air Force	1,000 6/	1,000 6/	1,005 6/	1,009 6/
Grand Total	116,868	120,573	146,929	160,625

1/ Less than one percent of total
6/ Does not include Army estimates of Air Force weapons in Chart II

Table 6

SURPLUS

	1949	1950	1951	1952
Production	210,000	240,000	275,000	300,000
Imports	5,000	3,000	—	—
Total Availability	215,000	243,000	275,000	300,000
Requirements Civilian and Military	116,868	120,573	146,929	160,625
Surplus (Stockpiling)	98,132	112,427	128,071	139,375

Table 7

SUMMARY

RESOURCES AND ALLOCATION OF ALUMINUM, USSR
(Metric Tons)

REQUIREMENTS	1949	1950	1951	1952
I AGRICULTURE (total)	---	---	---	---
Tractors	---	---	---	---
General Equipment	---	---	---	---
II TRANSPORTATION 1/ (total)	17,339	21,750	27,135	27,066
Railroads	---	---	---	---
Motor	---	---	---	---
Inland Water	---	---	---	---
Pipe Lines	---	---	---	---
Civil Air	---	---	---	---
Shipping (Merchant Marine)	---	---	---	---
III INDUSTRY 2/	58,000	65,000	72,600	81,500
IV HOME USE	10,900	12,300	13,800	15,500
V MILITARY (total)	30,629	31,523	33,394	36,559
Army (Ground force weapons)	3,300	3,300	3,300	3,300
Air Force	25,381	25,792	26,800	28,451
Navy	948	1,431	2,289	3,799
Misc. weapons, ammunition, Ground and Air Force	1,000 3/	1,000 3/	1,005 6/	1,009 3/
VI TOTAL REQUIREMENTS	116,868	120,573	146,929	160,625
VII PRODUCTION	210,000	240,000	275,000	300,000
VIII IMPORTS	5,000	3,000	---	---
IX TOTAL AVAILABILITY	215,000	243,000	275,000	300,000
X SURPLUS	98,132	112,427	128,071	139,375
XI DEFICIT	---	---	---	---

1/ Slight increase only contemplated in total gross tonnage of Merchant Marine; and total oil consuming locomotives remain substantially constant.
2/ Includes Atomic Energy Requirements.
3/ Does not include Army estimates of Air Force Weapons in Chart II

VI. PETROLEUM

Soviet Crude Oil Production

In the selection of the method for determining petroleum production in the USSR, two factors were considered. (1) The petroleum goal under the current Five-Year Plan; and (2) Gosplan announcements of progress in the attainment of annual production quotas.

25X1X7

25X1X7 The manner by which estimates were made in crude oil production for the period 1945-1949 is described below. This was supplemented by [redacted] data independently arrived at through plant studies, captured German documents, returning PW's, defectees, US industrial experts, technical public contracts, and other such sources. The production figures were closely related to those arrived at here.

In the postwar period, beginning with the year 1946, the progress of crude oil production has been reported in terms of percentage increases over the previous year. Thus far, the official yearly rate of increase which has prevailed since 1945 has been as follows:

1. Oil production in 1946 increased 12 percent over 1945 1/
2. Oil production in 1947 increased 19 percent over 1946 2/
3. Oil production in 1948 increased 13 percent over 1947 3/
4. Baibakov, Minister of the Soviet oil industry, stated that the goal of the oil industry for 1949 was to increase oil output 12.3 percent over 1948 production. 4/

In order to establish an absolute figure to which the above percentage increases could be applied, CIA made use of information contained in BAKINSKIY RABOCHIY, 29 May 1946. This publication stated that during the fourth Five-Year Plan, the average annual increase in oil production will be 3.2 million tons, or a total of 16 million tons for the five years. Since the 1950 goal is 35.4 million tons, 5/ this implies that 1945 output was 19.4 million metric tons. If the official percentage increases are applied to this base figure for 1945, the oil production for each succeeding year appears as follows:

Year	Millions of Metric Tons
1945	19.4
1946	21.7
1947	25.8
1948	29.2
1949	32.8 6/

These estimates do not differ by more than 10 percent from the results derived from a large number of independent sources.

1/ IZVESTIYA, 21 January 1947
2/ IZVESTIYA, 18 January 1948
3/ IZVESTIYA, 20 January 1949
4/ PRAVDA, 15 March 1949
5/ Russian text of the fourth Five-Year Plan, PRAVDA, 21 March 1949
6/ This represents about 6 percent of the world's total production and about 10 percent of the US production.

These estimates are further confirmed, statistically and independently, by reference to a recent publication 1/ of the Soviet Embassy in Washington. This periodical shows the development and advancement of the petroleum industry in the USSR which was characterized in the following manner:

OIL. INCREASED OVER 1945, WHICH EQUALS 100 PERCENT

Year	Percentage Increases Over 1945 - 100 Percent
1946	112
1947	133
1948	151
1949 over 1948	112

If the year 1945 is assigned 19.4 million metric tons derived by the first method, then crude oil production by the above percentage increases is as follows:

Year	Percentage Increases Over 1945 - 100 Percent	Production (Millions of Metric Tons)
1945		19.4
1946	12	21.7
1947	33	25.8
1948	51	29.2
1949 over 1948	12	32.7

Although the fourth Five-Year Plan envisaged an output of 35.4 million metric tons of crude oil by the end of 1950, Soviet authorities have announced that the goal was to be reached during 1949. This revision was probably made because of the accelerated tempo of rehabilitation and development during 1946 and 1947, and in view of much greater need arising for the general speed-up of economic expansion in the USSR.

Estimates of Soviet crude oil production for 1950 through 1952 were made dependent on an average of 12 percent rate of increase which has prevailed generally since 1945. The relatively low level of crude oil output in 1946 and 1947 was primarily the result of emphasis placed on reconstruction and rehabilitation. With this phase of the plan largely completed by early 1948, the Soviet Union began concentrating on the exploitation of new fields, acquisition of new deep-well drilling equipment, and reactivation of wells that were out of production during the war. The Soviet announcement that the 1949 production would be 12.3 percent greater than 1948 and thereby surpass the prewar level of production, further indicates the current trend of oil output in the USSR.

1/ USSR INFORMATION BULLETIN, Volume IX, No. 15, 12 August 1949, p. 466.

Assuming that no drastic changes will occur to modify the average constant rate of production, it is considered logical to allow a 12 percent rate of increase from 1949 through 1952. Therefore, crude oil production in the Soviet Union for the period considered is given as follows:

Year	Millions of Metric Tons
1950	36.7
1951	41.1
1952	46.0

A check on the accuracy of the given estimates can be made only when more information is disclosed concerning the fulfillment of the current Five-Year Plan for petroleum.

Oil Field Equipment Industry

Since the planned expansion of the petroleum industry depends on the availability of oilfield equipment, the USSR has placed heavy emphasis on the rapid development of the Soviet oil-field equipment industry in order to lessen Soviet dependence on foreign sources of supply. By 1950, Soviet production is planned to be 2.5 times the output in 1940, with a considerable increase in the variety of items manufactured. An indication of Soviet requirements may be found in the equipment shipped to the USSR from the US; about half of which was drilling equipment, and the remainder cementing and prospecting equipment. A shortage in fabricated steel and measuring and control instruments will further hinder the expansion of oil-equipment production.

The Soviets have improved their postwar supply of oil field equipment by dismantling oil-field facilities in the Satellites. It is also estimated that in Germany the Soviets dismantled synthetic fuel equipment totalling approximately one million tons in refined products capacity. Also, recent Soviet trade arrangements with Czechoslovakia and Sweden indicate that the Soviets are concentrating particularly on obtaining pipe and tubing for their oil fields.

US shipments of approximately $64 million worth of petroleum equipment to the USSR during 1941-1944 was a decisive factor in keeping the Soviet petroleum industry in operation. US shipments from 1945-1948 of some $44 million worth of equipment aided the Soviet oil industry to a point where the present production has reached the 1941 level. A continuation of such shipments to the USSR would aid the Soviets in production and increase the rate of expansion.

Petroleum Refining Industry

1. Petroleum Refining Equipment

Soviet refining capacity now exceeds crude oil output by about 15 percent. However, the shortage of high-grade refined products, particularly high-octane gasoline, indicates that lack of specialized equipment, such as catalytic cracking plants, alkylation and polymerization units, continues to be the outstanding deficiency in the Soviet petroleum industry. From available information, it appears that the USSR can produce only 35-50 percent of its high-octane combat aviation gasoline requirements for minimum airforce operations. This deficiency in specialized refinery equipment, which retarded the prewar development of the petroleum industry, was aggravated during the war by destruction of plants producing refinery equipment and by conversion of oil equipment plants to armament production.

Recent US restrictions on export of petroleum equipment and products to the USSR have been effective in bringing about this shortage. Another adverse factor is the Soviet limitation in operational efficiency and maintenance caused by a shortage of skilled workers and proper repair facilities.

Construction of sufficient catalytic cracking capacity is in the early stage. This process was introduced only after the end of the war with a shipment of four Houdry units under Lend-Lease. The orders for two plants were cancelled at the end of the war and the general lack of technical skill in the Soviet petroleum industry will obviate full utilization of the two completed units, as well as completion of the unfinished units. This shortcoming is evidenced in Soviet overtures for technical assistance from US companies that took part in installing the plants. Withholding shipments of this type of equipment has not only had the effect of restricting Soviet production of high-octane gasoline, but will probably accentuate the present shortage for several years.

2. Refined Products

a. Introduction to Table I

In estimating the yield of refined products, CIA took into account the chemical and physical characteristics of the crude oil, relative to the quality and quantity of each of the required products. The capabilities of the over-all refining plant, as well as of its individual components, such as general refining and cracking capacities, were also considered. These factors, together with the crude oil production, show the amount of each refined product of predetermined quality which will be available. The actual weights of each product were determined by taking a proportionate amount of each based on requirements. The volume of each product was subsequently determined from the weights on the basis of known specific gravities, and the percentages of each were calculated.

Table I shows the available refined products, both by weight and volume, based on the estimated indigenous crude oil production of 32.8, 36.7, 41.1 and 46.0 million metric tons.

b. Discussion of Table I

As explained above, the weights, volumes, and percentages of each product were determined on a proportionate basis of the requirement of each taking into consideration the characteristics of the crude oil as well as the necessary quality of the refined products and the capacity and capability of the over-all refining facilities.

For example, the yield of gasoline, which is the most important product, was determined at 21.6 percent by weight or 25.1 percent by volume of the crude oil. Since this is well within the potential production based on the above considerations, the actual breakdown to produce it would be as follows: (1) The average yield of gasoline from the available cracking stocks, based on the total cracking capacity, taking into account all factors including time cycle efficiency, is 45 percent; (2) The maximum statistical average yield (1944) for the US, which includes unused capacity, was 36.5 percent; the used capacity is thus approximately 80 percent; (3) Calculation from these factors as applied to the USSR gives a yield of 29.44 percent of cracked gasoline based on the charging capacity of the over-all cracking plant of 13 million metric tons. (4) The actual weight of cracked gasoline is thus 3.8 million metric tons. The total gasoline requirement is 7.1 million metric tons; therefore, the straight-run gasoline requirement is 3.3 million metric

Table 1

AVAILABLE REFINED PRODUCTS 1/

1949

Products Available

	Millions of Metric Tons	Percentage By Volume	Percentage By Weight
Gasoline	7.1	25.1	21.6
Kerosene	5.3	17.1	16.1
Diesel Oil	4.7	13.7	14.3
Lubricating Oil	1.8	5.3	5.5
Residual Fuel Oil	9.7	25.8	29.5
Total Refined Products	28.6		
Refining Loss and Fuel	3.3	10.3	10.0
Other Products	.9	3.0	3.0
	32.8	100.0	100.0

1/ The requirements of refined products for 1950, 1951, and 1952 may be met because of the adequacy and flexibility of thermal cracking plants in the production of gasoline and diesel oil. The indigenous refined products must, however, be supplemented by imports and synthetics.

tons, i.e., 10 percent of the crude oil available, thus making a total of 21.6 percent by weight of gasoline which is the figure cited above; (5) It is to be particularly noted that the yield of cracked gasoline is well within the potential as will be shown later, and the percentage of straight-run gasoline similarly is much lower than that present in the crude; (6) It must be borne in mind, however, that while more gasoline can be produced, the yield is definitely limited in order to obtain a balanced production of gasoline against the other required products as to quantity and quality.

The other products, namely, kerosene, diesel oil, lubricating oils, and residual fuel oil were also distributed proportionately based on the requirements of each and the amount of crude oil available. The possible yields of these products were determined by their characteristics and the amount of each present in the crude oil. This applies especially to the production of kerosene and lubricating oils. The limiting factor in the yield of diesel oil is the minimum quality which is acceptable on the one hand and the necessary quality of the residual fuel oil on the other, as these are tied together in the refining process. Refining loss, fuel, and other products, such as wax, asphalt, coke, etc., are estimated according to the general practice of taking into account the yields of the other products.

Aviation Fuels

1. Aviation Gasoline

Because the Soviets are deficient in equipment such as catalytic cracking plants, alkylation and polymerization units, for production of aviation gasoline, this commodity lags far behind requirements. From available information, it appears that the USSR can produce only 35-50 percent of its high-octane combat aviation gasoline for minimum air-force operations. However, ample jet fuel production facilities are available along with sufficient crude oil supplies to satisfy requirements for air-force operations, providing sufficient and satisfactory jet-propelled aircraft are available.

Table II indicates the present aviation gasoline production within the USSR. The estimated Soviet aviation fuel requirements for the first year of operations would be 2,516,310 metric tons of high-octane combat aviation gasoline, and 646,758 metric tons of jet fuel.

In the US, aviation gasoline generally refers to 95-100+ octane either for combat or commercial transport uses, but in the USSR, gasoline of 75-85 octane was widely employed as aviation fuel. The production of this latter grade will, therefore, be included, although it is recognized that for combat purposes only 95-100+ octane should be considered.

In the US, aviation gasoline is made generally by means of blending a catalytic cracked base material with high octane components, such as polymer and alkylate, and with ethyl fluid. During the war, aromatic hydrocarbons such as benzene, toluene, xylene, and cumene, made largely by catalytic conversion of petroleum hydrocarbons, were also employed as blending agents. With regard to quality, even the gasoline employed for transport planes is superior to 95+ octane rating and generally better than 100+. For combat purposes, 100-130+ octane rating was employed during World War II.

In the USSR, however, where the specialized equipment for making 100+ octane combat aviation gasoline, such as catalytic cracking, polymerization, alkylation, etc., are scarce, the situation is quite different. Substantial quantities of relatively low grade aviation gasoline, i.e., 75-85 octane rating useful for transportation and ground support only, are employed, although their use would not be considered in the US. To make the latter grade, straight-run gasoline with octane rating of 70-78 has been distilled from special crudes, such as Grozny (Malgobek), Baku, and Maykop oilfields. These are compounded

Table II

AVIATION GASOLINE PRODUCTION, U.S.S.R.
(Thousands of Metric Tons per year)

Regions	Cracking Capacity	High-Octane 1/ Production (95-100+ octane)	Other Avgas 2/ Production (75-85 octane)	Total
SOUTHEAST	3,119	300 (Grozny)	380	680
TRANSCAUCASUS	3,622	---	440	440
VOLGA	2,532	250 (Saratov)	307	557
CENTRAL INDUSTRIAL	699	---	085	085
URALS	713	290 (Orsk-135) (Ufa-155)	087	377
KAZAKHSTAN & CENTRAL ASIA	1,657	130 (Guriev)	202	332
	12,342	970	1,501	2,471

1/ Based on established plant installations capable of producing high-octane combat aviation fuel of 95-100+ octane rating.

2/ Based on estimate of fuel produced by thermal cracking including polymerization and alkylation and selective fractionation of both cracked and selected straight run distillates and USAF consumption estimates of average USSR front-line air force operations during World War II. Quality (75-85 octane) estimates probably suitable for transport and low-flying ground support and attack confirmed in "USSR Technical Standards for Petroleum Products", Glavneftesnab, 1946, and other sources.

on a relatively small scale with higher octane components such as pyrobenzene, alkylated aromatics, and some polymer and alkylate components, as well as on a much larger scale with selected fractions of thermally cracked gasoline and tetraethyl lead to produce the required 75-85 octane product. For the relatively small quantity of 100-octane gasoline produced, the methods and components referred to above for the US are employed in a limited manner.

High-octane blending agents, such as benzene, toluene, and cumene, which were found necessary to the US high-octane production during World War II, are in short supply in the USSR even for the chemical and explosives industries, and cannot be counted on to augment the supply of high-octane gasoline.

2. Tetraethyl Lead

Tetraethyl lead, perhaps the most important component of combat aviation gasoline to improve its anti-knock rating, is made at the Oka and Kalinin plants in Dzerzhinsk and the Olginsky plants in Moscow. No other producing areas for this highly critical material are known.

Two typical US leaded fuels are shown below as examples:

(1)	Tetraethyl lead	63.3%
	Ethyl bromide	25.75
	Ethyl cloride	8.73
	Dye and other materials	2.23
(2)	Tetraethyl lead	62.0%
	Dibromoethane	26-28
	Kerosene, dye, and other materials	8-10

The last mixture is classed as 1-T in the USSR where a similar mixture is made, classed as grade 1-T.S.

Tetraethyl lead is a vital material for the production of combat aviation gasoline, because a relatively small amount is required to produce a very large increase in the octane rating (the amount employed is generally 3 to 6 ccs per gallon, i.e., about 1 to 1.75 parts per 1000 volume) of the fuel.

An important report on the production of the sodium-lead amalgam employed in the manufacture of lead tetraethyl was submitted by ECIA-RT-347-49 dated 21 March 1949. This report shows the method of production of the amalgam or alloy in sufficient detail to permit calculation of the daily output which was determined at 1000 liters.

From the data shown, including the derived production of 1,000 liters of sodium-lead alloy per day, the yield of lead tetraethyl and ethyl fluid may be calculated. From the 1,000 liters of the alloy a volume of 2,350 liters per day of lead tetraethyl may be produced. This can be made up to 3,525 liters or 3,525,000 ccs of ethyl fluid. At the rate of 4 cc per gal. of combat aviation gasoline, this is sufficient for the treatment of 875,000 gals., which is 72 percent of the estimated daily production. At the rate of 6 cc of ethyl fluid per gallon, 48 percent of the production can be treated. With the operation of the additional 32 cells, and assuming sufficient capacity for the conversion of the sodium-lead alloy to lead tetraethyl at the Oka and Kalinin plants at Dzerzhinsk practically the entire present estimated production of combat aviation gasoline may be treated. This raises the question of the source of supply of sodium-lead alloy at the Olginsky plant in Moscow and whether additional lead tetraethyl over the estimated requirement is produced; also whether it is used in aviation gasoline of lower grade or in motor gasoline.

3. Jet Fuel

Ample jet fuel production facilities are available along with sufficient crude oil supplies to satisfy requirements for airforce operations, providing there are sufficient and satisfactory jet-propelled aircraft. The availability of jet fuel is limited primarily by composition of the crude oil. Jet fuel consists generally of naphtha, kerosene, and light gas oil, or a mixture of any of them. On the assumption that naphtha is included in the motor gasoline and that jet fuel comprises the total kerosene and light gas oil in the crude, a maximum of 31 percent of the crude, or 10 million metric tons per year, may be obtained from 33.3 million metric tons of crude oil.

If heavy naphtha is included with this, comprising about 25 percent of the gasoline, an additional 6 percent based on the crude may be obtained, making a total of 37 percent. Thus, with the sacrifice of other products, a maximum production of approximately 12 million metric tons of jet fuel is possible, and this should be ample for Soviet needs. Widely scattered storage facilities point to serious attention by the Soviet planners in this direction. Based on present planning, however, high octane combat aviation is in short supply, and the amount of jet fuel required is relatively small, indicating that the program for jet plane production has been only partly developed.

Synthetic Fuel Industry

1. USSR

The Soviet Union is apparently further advanced on synthetic fuel development than had been previously realized.

Both the Hydrogenation and Fischer-Tropsch processes of synthetic fuel production are being developed vigorously. The main effort has been devoted to developing these two processes with a view to supplementing the short supply of avgas and lubeoils in the USSR. The Hydrogenation process will produce 70-75 octane gasoline, which can be increased to high-octane gasoline by additions of iso-octanes and tetraethyl lead; Fischer-Tropsch is designed to produce 50-70 octane gasoline, and octane ratings can be greatly increased by use of improved catalysts. While the Hydrogenation process produces better gasoline, including avgas, the Fischer-Tropsch process is receiving attention because of its ability to produce quality diesel and lubricating oils.

Existing centers of synthetic fuel production, mainly prewar experimental plants in the Kuzbas and near Lake Baikal, have been expanded by the additions of dismantled German plants and the construction of new ones.

The center of activity is apparently localized to areas which are distant from petroleum producing areas but which have suitable coal deposits easily available for use as raw materials. Therefore, the stimulus for the synthetic fuel plant in the Kuzbas and Transbaikal is to make these regions self-sufficient in fuels and lessen the load on the limited transportation facilities.

2. Satellites

There are only two areas of Eastern Europe outside the USSR where synthetic petroleum products are manufactured. The synthetic gasoline plant at Most in Czechoslovakia was originally designed by the Germans during World War II to produce one million tons of gasoline a year by means of hydrogenation of local coal. Estimates of present output range from 10-50 percent of capacity. The most recent information places it at 20-25 percent.

In the Soviet Zone of Germany there are six important and several smaller synthetic plants. In 1944, the six plants had an aggregate capacity of 2,270,000 metric tons. In 1947, after bomb damage and dismantling,

the total capacity was 1,000,000 metric tons. It is estimated that only 60 percent of this capacity was utilized in 1949.

Requirements and Consumption

1. Methods

Thus far, strict control over the supply of petroleum and refined products in the USSR has prevented shortages which would effectively impair the Soviet plans for economic development. The Soviet Union is continuing to adhere to an allocation system which has allowed for careful scheduling of available supply of refined products to meet the essential needs of principal consumers within the Soviet economy.

It should be emphasized that the Soviet Union is in a position to reduce her civilian petroleum consumption by force in a manner inconceivable in the US. Judged by Western standards, present Soviet production of refined products is insufficient to meet the increasing requirements of an expanding economy, but severe restrictions on civilian and industrial consumption allow the Soviet Union to bring its supply and minimal requirements into rough balance. From an economic point of view, strict allocations are designed to meet only the essential industrial needs and to eliminate marginal consumers gradually. From the military point of view, control of allocations enables the Soviets to have additional supplies of refined products for their particular needs as well as to accumulate a surplus.

The various indices of industrial requirements derived in this report are based mainly on the prewar relationship between domestic consumption and the extent to which the principal consumers of petroleum products have been rehabilitated and expanded. The indices established for 1940 and 1944, together with the postwar conditions of the principal consumers, were projected into 1949 through 1952 as indicative of the probable consumption pattern for that period.

The conclusions in this section of the report are intended to serve primarily as indices of the trend of Soviet postwar petroleum consumption. The methods and assumptions used were largely reflected by the following fundamental factors:

(1) prewar trends in petroleum production and consumption of refined products;
(2) expected growth of the principal consumers;
(3) postwar expansion of the petroleum industry;
(4) continued imports from satellites; and
(5) continued control over allocations.

25X1X7

Moreover, a careful review of all petroleum studies by the State Department, Army, Navy, Air Force, JIC, JCS, [redacted] ASPB, SDS, and SID, were analyzed. Pertinent material from these reports was extracted and taken into account in forming the basis of the Soviet consumption pattern for the years 1940, and 1949 through 1952.

In an effort to establish a basic structure which would show the distribution of petroleum products among the principal consumers of the Soviet economy in 1940, particular emphasis was given to the British system of proportional allocation. Here, the total petroleum products available to the Soviets in 1940 were categorically allocated according to the main POL

25X1X7 consumers. Below is the percentage allocation system 25X1X7 [redacted]

Table III

Consumers	Percentage Allocations in 1940
Agriculture	26
Industries	26.3
Railways	10.3
Commercial Vehicles	5.8
Shipping	3.0
Home Lighting & Heating	10.4
Military & Stocks	18.2
	100.0

The 1940 computations were checked with all previous estimates and reports 25X1X7 which would bear on the validity of the percentage allocations employed 25X1X7 [redacted] Therefore, this distribution was included in the 1940 petroleum consumption table since it was found that, by and large, the percentage allocations could be corroborated by most sources on Soviet POL consumption requirements.

In order to have the principal consumers conform to specific areas of interest, the table was rearranged and somewhat modified. Use was made of certain factors found in several of the State Department and SDS documents which avoid the cumbersome breakdown of individual users of automotive vehicles within each main consumer category i.e., instead of showing the use of such vehicles in industry, a section has been set up to include the entire automotive park in the USSR under Transport Motor. Also, military stocks were excluded from the consumption and requirements for Military. Thus, the following re-distributed allocations have been used in this report:

Table IV

Consumers	Percentage Allocations in 1940
Agriculture	23
Transportation Rail	12
Transportation Motor	18
Industry	23
Shipping	6
Home USE	10
Military	8
25X1X7	100

It should be noted that [redacted] the total consumption of Commercial Vehicles and Industries is 32.1 percent whereas the total revised percentages are assigned 40 percent to the two classes.

2. Requirements and Consumption of Refined Products, 1940

In 1940, the USSR produced 31.0 million metric tons of crude oil. Of this total, 26.3 million metric tons of refined products were produced, allowing 4.65 million tons for refinery loss and other products. This indigenous production was distributed according to the above percentage allocations and translated into the amounts of POL that would be available to each main consumer e.g., agriculture received 6.0 million metric tons of refined products in 1940, and shipping 1.6 million metric tons, etc.

Until the outbreak of the war, production surplus over consumption and exports lends credence to probable stockpiling in the USSR. A report (Gen. Proj. No. J-89), states that the total stockpiles seem to have been 14-15 million tons before the war, of which the Soviet armed forces alone are said to have stored 7.5 million tons. Nevertheless, the extent of Soviet prewar stockpiling cannot be definitely established and for purposes of this report are not included in the 1940 total. Also, it can be assumed that POL were mainly designed for consumption by the Soviet armed forces.

3. Requirements and Consumption of Refined Products, 1949,1950,1951 and 1952.

Estimates of petroleum consumption by the various classes of consumers in peacetime 1949-1952 were developed in consideration of the status of the petroleum industry, the distribution of refined products, the effect of the war, and the relative position of the Soviet economy in 1949. Analysis of the minimum quantity of petroleum products that would be required to allow for the recovery of various segments of the Soviet economy was included.

Tables V through IX, which are based on the foregoing considerations, show the estimated requirements of refined products in millions of metric tons for the period 1949-1952. They include the individual products: namely gasoline, kerosene, diesel oil, lubricating oils, and residual fuel oil, for each of the principal consumers, including agriculture, transportation rail, transportation motor, industry, shipping and home use, as well as for military. Also shown are the totals of each product in millions of metric tons for all industrial categories and the percentage which this bears to the total of refined products; as well as total requirements by the principal consumers.

A detailed description of each of the various industries in relation to their POL consumption is shown in the appendices.

Estimates were made and checked by specialists in the various fields of interest as to the quantity of petroleum products needed to operate the economy at the current level of industrial activity. Use was made of such critical indices as the growth of the tractor park, ton-kilometers of freight hauled, and activity in the machine tool industry, as an indication of the general industrial growth within the Soviet Union.

The appendices show in detail the methods and calculations employed in estimating the POL requirements for the various categories of the industrial economy.

a. Agriculture

In estimating the requirements for agriculture a total of 452,000 tractors in full-time use in 1949 is indicated. It is also estimated that this number will increase in 1950 to 464,000; in 1951 to 473,000 and in 1952 to 500,000. Despite the fact that the number of tractors in 1949-1952 is less than in 1940, the total horsepower will be greater to the extent that the POL requirements of all kinds will increase from 5.9 million metric tons in 1940 to 7.8 million metric tons in 1952.

b. Transportation (Rail)

Although several methods were available for estimating the requirements for railroads, it was concluded that the actual data available for 1940 showing the relative percentages of various fuels employed in terms of thermal units was sufficiently accurate. This resulted in a total fuel consumption of 3.0 million metric tons for the railroads for that year. From all available information, the increased traffic is being largely met by increased production of coal-burning units although there is a small but steadily growing use of Diesel-electric units which appear to be replacing the old oil-burning steam locomotives. Therefore, there appears to be no appreciable change in the oil fuel requirements for the year 1949-1952 although lubricants and grease will increase.

c. Transportation (Motor)

With regard to the POL requirements for the civilian-motor industry, inventories of the serviceable trucks, motor vehicles, etc. were made and the POL utilization estimated for 1949, the estimated postwar production data (745,000 vehicles, 670,000 trucks) were combined with prewar estimates (110,000 serviceable prewar or lend-lease vehicles). Military inventories of trucks were made independently. The 1950-1952 estimates were made by combining estimated new production with estimated retirements of existing inventories. POL requirements were then estimated and based on an average utilization of 20,000 miles per vehicle per year for trucks, and 10,000 miles per vehicle per year for passenger cars and weighted averages of fuel consumption were obtained of 7 miles per gallon for gasoline trucks, 6.4 miles per gallon for Diesel trucks, 15 miles per gallon for light passenger cars, and ten miles per gallon for heavy passenger cars. Consumption of lubricating oil and grease was computed on the basis of 5 percent of the gasoline and Dieseloil requirement by weight.

d. Merchant Shipping

The current status of the sea-going Merchant fleet under Soviet registry comprises about 522 vessels of 1,000 gross tons and over. Of this total, 201 are oil-burning vessels, consisting of 89 diesel-powered ships and 112 steamships powered by fuel oil.

In the Caspian Sea there are 119 vessels of more than 1,000 gross tons, 92 of them tankers, 27 freighters. Of the tankers 21 are diesel-powered and 71 use fuel oil. Of the freighters ten are diesel-powered and seventeen use fuel oil.

In estimating fuel consumption CIA employed actual records, or where not available consumption rates based on comparable tonnages. Consumption rates were computed on basis of actual number of ships in each gross tonnage class taking into account days at sea and in port.

e. Inland Waterways

In order to estimate POL requirements for inland waterways, consideration was given to horsepower inventory of the river fleet; fuel consumption of the inventory by types; annual number of hours of operation of all self-propelled oil-burning vessels, and fuel consumption of horsepower hours of operation.

It is estimated that the horsepower inventory of the river fleet was 850,000 at the end of 1949, and will be 910,000 at the end of 1950. Mid-year inventories for these years may be obtained from these data and similar inventories for 1951-1952. Consideration was taken of the allocation 25X1X7 of horsepower inventories to coal and to oil-burning vessels: [redacted] 25X1X7

25X1X7 [redacted] Based on the assumption of 200 days of operation annually for the average river vessel, and on the utilization time of 37.2 percent, the average number of 1706 hours of operation for each self-propelled river boat is derived, and from this figure the total horsepower hours of operation may be obtained.

On the basis of known factors regarding metric tons of diesel and fuel oil, and the horsepower hours, the total requirements of the river fleet for 1949-1952, inclusive, have been estimated at approximately 266,000, 286,000, 309,000, and 335,000 metric tons, respectively. As for the other requirements, references and detailed data are shown in the Appendix.

f. Industrial Requirements

Requirements for the manufacturing and mining industries, which have been combined under the general heading of "Industrial Requirements", are largely estimated on the basis of the 1937-1940 trend, as well as on the estimated trend of industrial consumption of petroleum products by industry. Also, it has been noted that while the requirements for industry have increased in tonnage during this period, industry has consistently accounted for approximately 23 percent of the total annual consumption by all of the major consumer categories considered herein.

Consumption of petroleum in 1950-1951-1952 was therefore estimated by assigning to industrial requirements 23 percent of the total annual petroleum consumption for each of these years. It is believed logical to assume that industry generally will keep step in petroleum consumption with agriculture, transportation, and the other categories in the civilian industrial economy in the same manner as in the past e.g., by actual records for 1937-1940.

g. Home Use

In estimating postwar consumption of kerosene and fuel oil for home use, it was assumed that domestic burning oil is used primarily by the urban population for heating purposes and that kerosene is used chiefly by the rural population for lighting and cooking purposes. Formerly, kerosene was widely used in the country for lighting and in the city for cooking and heating. Rural electrification and the use of domestic burner oil having been expanded, more kerosene has become available as a jet fuel. It is assumed, therefore, that 1949 has been no greater than the 1940 home consumption. The increasing tempo of cold-war conditions would also be felt in restrictions of consumption of petroleum products for home use; and on this basis, consumption in 1949 has been no greater than that allocated in 1940.

h. Military Requirements

Military requirements for refined petroleum products for the period of 1949-1952, inclusive, have been prepared by the Department of the Army, Navy, and the Air Force. These data are included in this report and are shown in detail as part of the Appendix.

4. Tables

The methods of obtaining these estimates are shown in detail in the appendix. The data were combined with military requirements, production and imports. The data are shown in Tables VI to XI. In general, the consumption pattern for 1949 does not differ much from the base year 1940. The principal difference reflects recent Soviet emphasis on gasoline and diesel fuel alike. Kerosene constituted the bulk of Soviet production before the war. This would indicate that a change in the pattern of petroleum consumption in the USSR is somewhat similar to changes which occurred in the US some years ago, namely a shifting from a kerosene economy to a gasoline and diesel oil economy.

Table V

REQUIREMENTS OF REFINED PRODUCTS, 1940
(Millions of Metric Tons)

	Gasoline	Kerosene	Diesel Oil	Lubricating Oil	Total POL	Residual Oil	Total Requirements by Principal Consumers	Percentage Distribution
Agriculture	1.2 1/	4.1	.2	.4	5.9		5.9	23
Transportation Rail			.01	.5	.5	2.5	3.0	12
Transportation Motor	4.3			.2	4.5		4.5	18
Industry	.3	.3	.9	1.0	2.5	3.5	6.0 2/	23
Shipping			.4	.1	.5	1.1	1.6	6
Home Use		1.7			1.7	1.0	2.7	10
Military	.6		.5	.1	1.2	.9	2.1	8
TOTAL	6.4	6.1	2.0	2.3	16.8	9.0	25.8	100

1/ Includes 1.086 million metric tons of ligroin.
2/ Includes 700,000 metric tons for Power Stations.

Table VI

REQUIREMENTS OF REFINED PRODUCTS, 1949
(Millions of Metric Tons)

	Gasoline	Kerosene	Diesel Oil	Lubricating Oil	Total POL	Residual Oil	Total Requirements by Principal Consumers	Percentage Distribution
Agriculture	1.0	3.0	1.7	.3	6.0		6.0	20
Transportation Rail				.1	.1	3.0 1/	3.1	10
Transportation Motor	4.0		.2	.2	4.4		4.4	15
Industry 2/	.4	.3	1.0	1.0	2.7	4.0	6.7	23
Shipping 3/			.3	.1	.4	1.4	1.8	6
Home Use		2.1			2.1	1.0	3.1	10
Military	2.1	.1	1.7	.2	4.1	.7	4.8	16
TOTAL	7.5	5.5	4.9	1.9	19.8	10.1	29.9	100

1/ Includes Diesel Oil
2/ Includes 1.1 million metric tons consumed by Power Stations.
3/ Soviet Merchant Fleet and Inland Waterways Fleet:
   a. Diesel oil: 298,686
   b. Fuel oil: 1,419,879
   c. Luboil: 90,062

Table VIa

MILITARY POL REQUIREMENTS, 1949
(Metric Tons)

	Aviation Gasoline	Motor Gasoline	Kerosene (Jet)	Diesel Oil	Lubricating Oil	Residual Fuel Oil	TOTAL
Army		947,700		169,250	107,050		1,224,000
MVD		119,700			11,400		131,100
PVD		62,200			5,900		68,100
Air Force	412,000	188,000	80,000	33,000	34,000		747,000
Navy		427,230		1,555,424	35,962	653,552	2,672,168
	412,000	1,744,830	80,000	1,757,674	194,312	653,552	4,842,368

Table VII

REQUIREMENTS OF REFINED PRODUCTS, 1950

	Gasoline	Kerosene	Diesel Oil	Lubricating Oil	Total POL	Residual Oil	Total Requirements by Principal Consumers	Percentage Allocation in 1950
Agriculture	1.0	2.4	2.7	0.4	6.5		6.5	19
Transportation Rail				.11	.11	3.0 1/	3.1	9
Transportation Motor	6.2		.3	.3	6.8		6.8	20
Industry	.5	.3	1.2	1.2	3.2	4.7	7.9	23
Shipping 2/			.3	.1	.4	1.4	1.8	5
Home Use		2.1			2.1	1.0	3.1	9
Military	2.2	.1	1.9	.2	4.4	.7	5.1	15
TOTAL	9.9	4.9	6.4	2.3	23.5	10.8	34.3	100

1/ Includes Diesel Oil

2/ Soviet Merchant Fleet and Inland Waterway Fleet
- a. Diesel Oil: 306,134
- b. Fuel Oil : 1,430,687
- c. Luboil : 91,277

Table VIIa

MILITARY POL REQUIREMENTS, 1950
(Metric Tons)

	Aviation Gasoline	Motor Gasoline	Kerosene Jet	Diesel Oil	Lubricating Oil	Residual Fuel Oil	TOTAL
Army		965,800		181,000	109,006		1,255,806
MVD		119,700			11,400		131,100
PVD		62,200			5,900		68,100
Air Force	412,000	138,000	80,000	33,000	34,000		747,000
Navy		466,135		1,712,155	37,477	700,543	2,916,310
	412,000	1,801,835	80,000	1,926,155	197,783	700,543	5,118,316

Table VIII

REQUIREMENTS OF REFINED PRODUCTS, 1951
(Millions of Metric Tons)

	Gasoline	Kerosene	Diesel Oil	Lubricating Oil	Residual Oil	Total POL	Total requirements by Principal Consumers	Percentage Allocation in 1951
Agriculture	1.0	1.6	3.9	0.5		7.0	7.0	18
Transportation Rail				.1	3.0 1/	.1	3.1	8
Transportation Motor	7.8		.5	.4		8.7	8.7	23
Industry	.5	.4	1.3	1.3	5.3	3.5	8.8	23
Shipping 2/			.3	.1	1.5	.4	1.9	5
Home Use		2.2			1.0	2.2	3.2	9
Military	2.3	.1	2.1	.2	.8	4.7	5.5	14
TOTAL	11.6	4.3	8.1	2.6	11.6	26.6	38.2	100

1/ Includes Diesel Oil
2/ Soviet Merchant Fleet and Inland Waterway Fleet:
a. Diesel Oil: 333,714
b. Fuel Oil : 1,468,916
c. Luboil : 94,936

Table VIIIa

MILITARY POL REQUIREMENTS, 1951
(Metric Tons)

	Aviation Gasoline	Motor Gasoline	Kerosene (Jet)	Diesel Oil	Lubricating Oil	Residual Fuel Oil	TOTAL
Army		993,000		188,750	112,750		1,294,500
MVD		119,700			11,400		131,100
PVD		62,200			5,900		68,100
Air Force	412,000	183,000	80,000	33,000	34,000		747,000
Navy		527,575		1,938,107	39,811	795,283	3,300,776
	412,000	1,890,475	80,000	2,159,857	203,861	795,283	5,541,476

Table IX

REQUIREMENTS OF REFINED PRODUCTS, 1952
(Millions of Metric Tons)

	Gasoline	Kerosene	Diesel Oil	Lubricating Oil	Total POL	Residual Fuel Oil	Total Requirements by Principal Consumers	Percentage Allocation in 1952
Agriculture	1.0	1.1	5.2	0.5	7.8		7.8	18
Transportation Rail				.1	.1	3.0 1/	3.1	7
Transportation Motor	11.2		.6	.6	12.4		12.4	28
Industry	.6	.4	1.5	1.5	4.0	6.1	10.1	23
Shipping 2/			.3	.1	.4	1.5	1.9	4
Home Use		2.2			2.2	1.0	3.2	7
Military	2.4	.1	2.4	.2	5.1	.9	6.0	13
TOTAL	15.2	3.8	10.0	3.0	32.0	12.5	44.5	100

1/ Includes Diesel Oil
2/ Soviet Merchant Fleet and Inland Waterway Fleet:
a. Diesel Oil: 343,628
b. Fuel Oil : 1,483,303
c. Luboil : 96,554

Table IXa

MILITARY POL REQUIREMENTS, 1952
(Metric Tons)

	Aviation Gasoline	Motor Gasoline	Kerosene (Jet	Diesel Oil	Lubricating Oil	Residual Fuel Oil	TOTAL
Army		1,010,900		197,300	116,000		1,324,200
MVD		119,700			11,400		131,100
PVD		62,200			5,900		68,100
Air Forces	412,000	188,000	80,000	33,000	34,000		747,000
Navy		602,719		2,196,238	42,811	930,555	3,772,323
	412,000	1,983,519	80,000	2,426,538	210,111	930,555	6,042,723

Table X

SATELLITE SHIPMENTS OF PETROLEUM PRODUCTS TO THE USSR

Commodity	1949	1950	1951	1952
Gasoline	1.0	1.1	1.2	1.3
Kerosene	.3	.3	.4	.4
Diesel Oil	.3	.3	.4	.4
Lubricating Oil	.1	.1	.1	.1
Fuel Oil	.6	.7	.7	.8
TOTAL	2.3	2.5	2.8	3.0

References:

1. R-185-48, 29 March 1949, JANA Rumania - "Petroleum Production in Rumania."
2. St. Rpt. #11, 31 January 1949, Legation Vienna - "Austrian Oil Production."
3. St. Rpt. #140, 27 September 1949, Legation Budapest - "Economic Report First Six Months 1948."
4. St. Rpt. #155, 12 November 1947, Legation Budapest - "Hungary's Oil Position"
5. R - 105 - 48, 20 March 1947, S - 2 Berlin Command - "POL Situation in Soviet Zone."
6. St. Desp. #237, 24 February 1949, Berlin - "Chemical Production in 1948 and Production Plan 1949 in Sovzone Germany."

Table XI

SITUATION OF THE PETROLEUM SITUATION
OF THE USSR, 1949-1952
(Millions of Metric Tons)

	Indigenous 1/ Requirements (Refined Products)	Indigenous 2/ Availability (Refined Products)	Indigenous Deficit	Imports 3/	Synthetic 4/ Fuel Production	Surplus
1949	29.9	28.6	1.3	2.3	1.0	2.0
1950	34.3	31.8	2.5	2.5	1.0	1.0
1951	38.2	35.8	2.4	2.8	1.0	1.4
1952	44.5	40.0	4.5	3.0	1.0	0.5 5/

1/ See Tables VI, VII, VIII, & IX.

2/ See Table I

3/ See Table X

4/ See Chapter on Synthetic Fuel Production

5/ Represents a deficit of 500,000 metric tons.

Table XII

SUMMARY

RESOURCES AND ALLOCATION OF PETROLEUM, USSR
(Metric Tons)

REQUIREMENTS	1949	1950	1951	1952
I AGRICULTURE (Total)	6,000,000	6,500,000	7,000,000	7,800,000
Tractors	--	--	--	--
General Equipment	--	--	--	--
II TRANSPORTATION 1/ (Total)	9,300,000	11,700,000	13,612,000	17,312,000
Railroads	3,100,000	3,100,000	3,100,000	3,100,000
Motor	4,400,000	6,800,000	8,700,000	12,400,000
Inland Water	300,000	300,000	300,000	300,000
Pipe Lines	--	--	--	--
Civil Air	--	--	--	--
Shipping (Merchant Marine)	1,500,000	1,500,000	1,512,000	1,512,000
III INDUSTRY 2/	6,700,000	7,900,000	8,800,000	10,100,000
IV HOME USE	3,100,000	3,100,000	3,200,000	3,200,000
V MILITARY (Total)	4,842,348	5,118,316	5,543,476	6,042,723
Army (Ground Force weapons)	1,423,200	1,455,006	1,493,700	1,523,400
Air Force	747,000	747,000	747,000	747,000
Navy	2,672,148	2,916,310	3,300,776	3,772,323
Misc. Air Force weapons, ammunition, Ground and Air Force	--	--	--	--
VI TOTAL REQUIREMENTS	29,942,348	34,318,316	38,153,476	44,454,723
VII PRODUCTION	28,600,000	31,800,000	35,800,000	40,000,000
VIII IMPORTS 3/	3,300,000 3/	3,500,000 3/	3,800,000 3/	4,000,000 3/
IX TOTAL AVAILABILITY	31,900,000	35,300,000	39,600,000	44,000,000
X SURPLUS	1,957,652	1,018,316	1,446,524	--
XI DEFICIT	--	--	--	454,723

1/ Slight increase only contemplated in total gross tonnage of Merchant Marine; and total oil consuming locomotives remains substantially constant.
2/ Includes Atomic Energy Requirements.
3/ Includes Indigenous Synthetic Petroleum.

VII. ELECTRIC POWER

According to the provisions of the Fourth Five-Year Plan, covering the period 1946-1950, the prewar capacity of electric generating plants in the USSR was to be more than doubled (109 percent increase), and the electric power output was to be increased by 70 percent. The planned rate of increase of capacity is greater than the planned rate of increase of output.

At the end of 1948, the USSR ranked second only to the US in the amount of electric generating capacity and in electric output, but even so, Soviet capacity and output were only about 22 and 19 percent respectively of that of the US. 1/

The USSR is in a strong position with respect to the prime sources of energy, with enormous reserves of coal and peat and a very large water power potential. Up to the present time the last has been developed only to a small degree despite the great emphasis placed on hydro development in all of the Five-Year Plans. Oil as a source of electric power generation occupies a relatively small place, and is important principally in the Transcaucasus.

Approximately 85 percent of the total electric output of the Soviet Union is produced in thermal plants, including diesel plants. Although this proportion may be reduced as the planned large hydro developments are completed, the Soviets will continue to depend on adequate supplies of coal and oil to meet their requirements of electric energy. Therefore, electric power supply would be seriously handicapped by any interruption of coal mining or transportation.

Table 1 shows the production of electric energy in the USSR since 1928 and is indicative of the great progress made by the industry. The estimated production in 1950 is about sixteen times that of 1928, a major accomplishment, even considering the relatively low starting point.

1/ Based on estimates for USSR and actual US figures according to Edison Electric Institute Bulletin No. 16, June 1949, pages 6 and 8.

Table 1

ELECTRIC POWER OUTPUT IN THE USSR 1928-1952
(Billion KWH)

a/	1928	5.01		1941	50.20
	1929	6.22		1942	33.31
	1930	8.37		1943	36.23
	1931	10.69	c/	1944	40.00
	1932	13.54	d/	1945 x	43.40
	1933	16.36	d/	1946 x	47.80
	1934	21.02	e/	1947 x	55.00
	1935	25.90	f/	1948 x	64.10
	1936	32.80	g/	1949	72.90
	1937	36.40	h/	1950 x	82.00
	1938	39.60	i/	1951	92.20
	1939	43.53	i/	1952	103.70
b/	1940	48.23			

a/ For years 1928 to 1943 inclusive from Strategic Intelligence Digest, CIA, Volume II, June 1947, Page 7-4.

b/ Fourth Five Year Plan, 1950 planned output, 82.0 Billion KWH is to exceed 1940 output by 70%.

c/ Estimated.

d/ Amer. Embassy, Moscow "Performance of Soviet Economy in 1947, Barnes" states output of electric power was reported as having increased 15% in 1947 over 1946 and 10% in 1946 over 1945.

e/ "Elektrochevskie Stantsiya" #12, 1946 states that increase of 13% over 1946 level would be same as increase of 9% over 1940 level. "Komsomolskaya Pravda", 5 March 1947 states production in 1947 will be 12.2 over 1940 figure. Ministry of Electric power stations reported Plan fulfilled 101% in 1947. Calculations result to about 54-55 billion in 1947 and about 47 billion in 1946. "Elektrochevskie Stantsiya", #1, 1948 states that 1947 production was 14% greater than 1940. This also results in about 55 billion KWH for 1947.

f/ "Elektrochevskie Stantsiya", #1, 1949 states that 1948 production increased 16.6% over 1947 and 33% over 1940. Calculated results are 64.01 and 64.13 billion KWH respectively.

g/ Assume that average annual percentage increase 1945-48, 13.9% is maintained in 1949. Further, State Dept. OIR #4800.7 June 1949 states "it appears that production in 1st Quarter 1949 was at an annual rate of above 71 billion KWH...it appears quite possible that 1949 production will reach 72 billion KWH."

h/ Same assumption as g/ would mean 82.5 billion KWH. Estimate fixed at fulfillment of plan.

i/ Assume 12.5% increase each year. Less than previous average annual percentage increases in belief that there will be some relaxation after special drive to meet the Plan goal.

x Other Estimates

25X1X7 [redacted]

		Amer. Acad. of Social and Political Science Annals, Vol. 263, May 1949.
1945	43.0	43.2
1946	47.0	47.5
1947	55.0	54.6
1948	63.0	63.4
1950	82.0	82.0

In the preparation of Table 1 installed plant capacity was considered. The data on this differ widely, particularly for the period after 1940. There is reason to believe that construction and rehabilitation progress is somewhat behind the planned goals, but not to such a degree that it will prevent the production progress indicated in Table 1, hence the 1950 Plan output will be reached.

On the basis of the above, the desired increase in standby or reserve capacity will not be attained and it follows that installed plant equipment will be subjected to longer hours of use and overloading in order to produce the planned outputs. The effect of such long-hour use and overloading on plant equipment cannot be accurately assessed at this time.

The projected estimates for increase in rate of electric power production for 1950 - 1952 was related to the rate of increase for 1946 to 1949. The results were of the same order as those for the gross industrial output. The estimates in Table 1 closely approximate planned outputs, and it is believed that the Soviet Union now has and will have in 1952 sufficient electric power to meet the over-all requirements of its industrial, military, and domestic economy.

Soviet exports and imports of electric power are not significant since there are no important transmission lines across international borders.

Allocation

The following discussion relates to allocation or requirements of electric power to broad divisions of the industrial economy; namely, agriculture, rail transportation, industry, and home use.

So far as electric power is concerned, shipping and motor transportation are eliminated from consideration as there is virtually no direct use of station-generated electric power in their operation. Electricity consumed in the manufacture of shipping and motor transport is included under industry.

Agriculture includes the use of electricity on collectivist farms or on any installations in strictly rural areas. It would not include electricity used in the production of agricultural machinery or farm home appliances.

Rail transportation includes electricity used primarily for the propulsion of railway and railroad trains. It is likely also that electricity used for lighting in railroad yards and for power and lighting in maintenance shops is not segregated in any reports from that used strictly for train propulsion. Therefore, electric power in rail transportation would include all use associated with the operation of both steam and electrified railroads, but would not include that used in the manufacture of railroad equipment.

The division entitled Industry is broad in scope and for present consideration includes all uses in the manufacture of products for industry and of consumer goods. It also includes electricity used in all forms of mining and in the basic industries such as steel, non-ferrous metallurgy, chemicals and lumber.

Home use includes all electricity furnished to residential consumers, except in rural areas, as well as electricity used in shops, stores, offices, and street lighting. It includes all uses in the municipal economy other than Transport and Industry.

Consumption Pattern

Table 2 summarizes the known data on the prewar consumption of the various branches of the Soviet economy together with an estimate of the 1950 pattern, 1/ and includes projected data for 1951 and 1952.

1/ State Dept. OIR Report No. 4322, 1 May 1947

Table 2 CONSUMPTION OF ELECTRICITY IN THE USSR BY MAIN CATEGORIES OF CONSUMERS

	1928 a/	1930 a/	1932 a/	1935 a/	1937 b/	1949 e/	1950 d/	1951 e/	1952 e/	1928 a/	1930 a/	1932 a/	1935 a/	1937 b/	1949 e/	1950 d/	1951 e/	1952 e/
	Billion kwh									Percent								
Industry	3.43	5.96	9.30	17.97	25.28	51.76	58.00	64.77	72.56	68.5	71.2	68.7	69.4	69.5	71.0	70.7	70.2	70.0
Transport	0.10	0.13	0.26	0.57	1.02	1.96	2.61	3.48	4.42	2.0	1.6	1.9	2.2	2.8	2.7	3.0	3.8	4.3
Municipal Economy	0.96	1.37	2.20	3.76	4.91	6.93	7.39	8.37	9.33	19.1	16.4	16.2	14.5	13.5	9.5	9.2	9.1	9.0
Rural Economy	0.04	0.05	0.09	0.19	0.33	2.19	2.80	3.23	3.53	0.8	0.6	0.7	0.7	0.9	3.0	3.4	3.4	3.4
Transmission Losses	0.35	0.53	0.96	1.93	2.62c/	5.25	5.90	6.55	7.26	7.0	6.3	7.1	7.5	7.2	7.2	7.2	7.1	7.0
Use by power Stations	0.13	0.33	0.73	1.48	2.22c/	4.81	5.30	5.90	6.53	2.6	3.9	5.4	5.7	6.1	6.6	6.5	6.4	6.3
TOTAL . . .	5.01	8.37	13.54	25.90	36.38	72.90	82.00	92.30	103.64	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

a/ Sotsialisticheskoye Stroitelstvo SSR 1936, pp. 86,87. Absolute figures given, percentages computed.
b/ SSR i Kapitalisticheskiye Strany, Moscow, 1939, p. 42. Percentages given, absolute figures computed.
c/ Figures for 1937 for categories 5 and 6 represent an estimated division based on a combined percentage of 13.3 given for the two categories by the source.
d/ See detailed discussion OIR Report No. 4322, 1 May 1947 pages 73 to 78 inclusive. 1949 data is estimated to be very close to that of 1950.
e/ Estimate

The data in Table 2, prepared in 1947 for all years with the exception of 1951 and 1952, agree with that of the Research Department of the South Manchurian Railway Company 1/ published in 1941. The differences in date of publication, in nomenclature of categories, and actual results, lead to the belief that different sources and methods of computation were used. Neither table gives figures for the war and postwar years but both clearly indicate that the pattern of use of electricity is not subject to radical change, particularly in industry, the major category. It is estimated that 1949 will very closely approximate 1950.

It is believed that during the war years the proportion of electricity used by Industry was higher than before or since and it is possible that during the height of the war at least three fourths of all power produced went to Industry. Even though great emphasis continues to be placed on industrial development by the Soviets and the total amount of power so used will be markedly increased, it seems probable that at least through 1952, about 70 percent of all Soviet electric power will be used in Industry.

As to the allocation of electricity to such specific basic commodities as steel, aluminum, petroleum, textiles and food, available data are inadequate and conflicting to the extent that no firm estimate can be made as to the total amount of electricity used in a particular industry, or the average KWH per unit of weight or volume. Some attempts were made to establish such criteria, but the results were inconclusive. It is believed, however, that the electric industry had advanced as rapidly, if not more so, than any other sector of the industrial economy. The conclusion of Table I indicates that Soviet expectations as to the total amount of electric output are being closely met and it can be concluded that the overall needs of industry will be met. Certainly this would be true for the more important basic commodities.

The Fourth Five Year Plan called for a tremendous increase in the amount of power used in Agriculture, even compared with such use in the years immediately preceding World War II. From a total consumption of 330,000,000 KWH in 1937, the Plan envisioned a consumption of 3,500,000,000 KWH 2/ in 1950, i.e. more than a ten fold increase. Available information 3/ and current estimates 4/ indicate that the 1950 consumption goal will not be reached until 1952, with consumption in 1950 and 1951 at 3.0 and 3.25 billion KWH respectively. Failure to meet the consumption goal, owing to inability to complete planned construction of the large number of small isolated plants, will not seriously affect the agricultural economy so far as military and food supplies are concerned.

Transportation requirements of electric power will continue to increase. Although the construction of electrified trackage appears to be behind planned schedules, there is an increase. Also, greater use of total trackage is evidenced by an appreciable increase in the number of electrified locomotives. Statistical figures on the use of electricity in transportation have been discovered only for the period from 1928 to 1937 and the sources 5/ 6/ are in close agreement as to the percentage of the total output used in transportation.

1/ South Manchurian Railway Co., Research Dept. captured Japanese Document No. 302926. "Electric Power Industry of USSR", published 1941.
2/ "Razvitie Selskogo Khoziaistva v Poslevoennoi Pyatiletke" by S.F. Damidov, Moskva, 1946, p. 185.
3/ OIR Report No. 4322, 1 May 1947, p. 76.
4/ ORE/EE estimate Aug 1949 (not published)
5/ OIR Report No. 4322, 1 May 1947
6/ South Manchurian Railway Co., Research Dept. Captured Japanese Document No. 302926.

Table 3 Percentage Total Electric Output Used by Transport

Sources	1928	1930	1932	1935	1936	1937	1950
So. Manch. Rwy.	2.0	---	1.9	2.4	2.1	3.2	---
OIR Rept #4322	2.0	1.6	1.9	2.2	---	2.8	3.0

Table 3 indicates that even at the maximum figure the proportion of transportation use to total production is relatively small and if an allowance of even 30 percent is made for error in the 1950 estimate, this element of the economy would require less than 4 percent of total electrical output. Table 4 shows a detailed breakdown of use of electricity in transportation.

Assuming that the needs of basic industry, agriculture, and transport will continue to have first priority on electric output, it follows that any remainder will be devoted to home use. This implies that the amount so available will be subject to uncontrolled variation and to a degree will be outside the use pattern. This does not necessarily mean that there is or will be a serious nationwide shortage of power for home use. Since, as already stated, electric production goals are being reached, it would appear that the amount of electricity available for home use is greater than ever before, although it is a lesser proportion of the whole output.

No detailed comment is made on electrical needs, available capacity, or required output, for the atomic energy program. It is believed that these requirements can be readily superimposed on existing capacities or those presently under construction. In certain areas, this might mean temporary restrictions on home use, but it would not seriously affect the general economy.

Conclusions

In summation this report arrives at the following conclusions:

(1) Capacity and Production: Although planned capacity may not reach the plan goal by 1950, the output from other existing plants will be sufficient to meet the needs of a peacetime economy.

(2) Allocation or requirements: There is now and will be in 1952 sufficient electric power to meet the needs of the important basic industries, including steel, aluminum, and petroleum. There will also be enough for essential transport, agriculture, and home use.

Table 4

USSR TRANSPORTATION REQUIREMENTS FOR ELECTRIC POWER
(See Appendix 4 for Method and Basis for Estimates)

Type of Facility	Unit	1949	1950	1951	1952
Railroads	Kilowatt Hours				
Operation		1,712,917,936	2,319,015,429	3,143,315,682	4,057,748,421
Manufacturing		390,121,568	525,034,148	430,313,404	433,043,884
Total		2,103,039,504	2,844,049,577	3,573,629,486	4,490,792,305
Motor Transport	" "				
Operation		59,207,040	83,443,840	111,316,160	138,149,760
Manufacturing		207,750,000	277,000,000	346,250,000	346,250,000
Total		266,957,040	360,443,840	457,566,160	484,449,760
Inland Waterways	" "				
Operation					
Manufacturing					
Total		117,803,210	182,087,370	153,965,760	220,732,590
Pipe Lines	" "				
Operation		187,014,218	207,487,431	225,339,309	239,411,529
Manufacturing		8,844,360	9,645,120	5,885,640	5,552,880
Total		195,858,578	217,132,551	231,224,949	244,964,409
Civil Aviation	" "				
Operation					
Manufacturing					
Total					
Shipping	" "				
Operation					
Manufacturing					
Total		8,450,000	8,450,000	8,450,000	8,450,000
TOTAL OPERATIONAL*		1,959,139,194	2,609,946,700	3,479,971,151	4,435,309,710
TOTAL MANUFACTURING*		606,715,928	811,679,268	782,449,044	784,846,764
GRAND TOTAL TRANSPORTATION**		2,652,914,950	3,612,163,338	4,424,835,955	5,499,389,064

* Does not include inland waterways or shipping since the totals listed above do not permit the separation of manufacturing and operational requirements.

** Includes all totals listed above.

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Table 5

SUMMARY

RESOURCES AND ALLOCATION OF ELECTRIC POWER, USSR
(Billion KWH)

REQUIREMENTS	1949	1950	1951	1952
I AGRICULTURE (Total)	2.19	2.80	3.23	3.53
Tractors	--	--	--	--
General Equipment	--	--	--	--
II TRANSPORTATION (Total)	1.96	2.50	3.46	4.43
Railroads	--	--	--	--
Motor	--	--	--	--
Inland Water	--	--	--	--
Pipe Lines	--	--	--	--
Civil Air	--	--	--	--
Shipping (Merchant Marine)	--	--	--	--
III INDUSTRY 1/	51.76	58.0	64.77	72.56
IV HOME USE	6.93	7.5	8.39	9.33
V MILITARY (Total)	--	--	--	--
Army (Ground force weapons)	--	--	--	--
Air Force	--	--	--	--
Navy	--	--	--	--
Misc., Air Force weapons, ammunition, Ground and Air Force	--	--	--	--
VI TOTAL REQUIREMENTS	62.84	70.80	79.85	89.85
VII PRODUCTION	72.90	82.0	92.2	103.7
VIII IMPORTS	--	--	--	--
IX TOTAL AVAILABILITY	72.90	82.0	92.2	103.70
X SURPLUS	-- 2/	-- 2/	-- 2/	-- 2/
XI DEFICIT	--	--	--	--

1/ Includes Atomic Energy Requirements.
2/ Production minus normal losses are equal to requirements.

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VIII. PROFESSIONAL ENGINEERS AND TECHNICAL MANPOWER

To supply industrial and other specialists for the fulfillment of its ambitious plans for economic development, the Soviet Union early initiated an intensive program for training these cadres in higher educational institutions and special technical secondary schools, supplementing these schools with correspondence courses and adult evening education. In the course of the successive Five Year Plans, the annual and cumulative numbers of graduates have increased several fold. As the educational system has expanded, the supplementary training programs have declined in importance in the training of specialists, although their facilities are still available.

The qualifications of the professional engineer and technician groups used herein are believed to represent the Soviet standard. The first groups (specialists of higher qualifications) consist of those with university or similar academic training. The second group (specialists of medium qualifications) includes those with training in special secondary schools, and the like. The third group in the Soviet classification, i. e., those with practical experience, has been excluded from this study; firstly, because of the lack of educational qualifications, and secondly, because it is anticipated that by the end of the next Five Year Plan, there will be a sufficient number of engineers and technicians. 1/ Nevertheless, it should be emphasized that the technicians with practical experience have been of primary importance in the past, for as late as 1946 they constituted 64.5 percent of the specialist group, although it is planned to reduce them to only 25.5 percent of the specialist class by 1950. 2/

The USSR appears to expect to fall short of requirements of engineers and technicians for industry by ten thousand and fifty thousand, respectively, leaving this deficit to be covered in the first two years of the succeeding Five Year Plan. Therefore, it is believed that by 1952, numerically at least, the USSR will have a sufficient supply of engineers and technicians to meet the requirements of the civilian economy. Consideration of the quality of the training of this personnel group is extremely difficult and will not be undertaken here.

There are strong indications that the peacetime requirements of the military organizations for engineers and technicians will be filled under the Five Year Plan. Additional requirements arising from a war could be filled with little effect on industrial production, through the withdrawal of some of the required engineers and technicians from non-industrial occupations, 3/ to replace technicians withdrawn from industry. Additional large numbers could be given accelerated training.

The technical manpower requirements for the military will be largely met by technicians although there is a definite need within the services for a relatively small number of highly trained professional engineers and scientists.

Contributions of engineers and technicians by the Satellite countries would probably be negligible, because even Czechoslovakia, Poland, and Hungary are suffering from shortages of such personnel.

1/ I. A. Lyasnikov, "Some considerations regarding the need for specialists in the USSR," Vestnik Vysshey Shkoly, Vol. VI, No. 4, 1948, p. 15.

2/ Ibid.

3/ Cf. Lyasnikov, Op. cit., showing that less than half of the trained chemists prewar were in chemical enterprises, indicating reservoirs of personnel outside industry.

TABLE 1. U.S.S.R. ESTIMATE OF NUMBERS OF ENGINEERS AND SPECIALISTS IN VARIOUS BRANCHES OF ECONOMY

	1937				1949				1950				1951				1952			
	WITH HIGHER EDUCATION	% OF TOTAL EMPLOYMENT	WITH MIDDLE EDUCATION	% OF TOTAL EMPLOYMENT	WITH HIGHER EDUCATION	% OF TOTAL EMPLOYMENT	WITH MIDDLE EDUCATION	% OF TOTAL EMPLOYMENT	WITH HIGHER EDUCATION	% OF TOTAL EMPLOYMENT	WITH MIDDLE EDUCATION	% OF TOTAL EMPLOYMENT	WITH HIGHER EDUCATION	% OF TOTAL EMPLOYMENT	WITH MIDDLE EDUCATION	% OF TOTAL EMPLOYMENT	WITH HIGHER EDUCATION	% OF TOTAL EMPLOYMENT	WITH MIDDLE EDUCATION	% OF TOTAL EMPLOYMENT
Agriculture	[1] 125,000	0.3	[1] 275,000	0.7	[2] 159,000	0.3	[2] 363,000	0.7	[3] 170,000	0.3	[3] 395,000	0.8	[4] 181,000	0.4	[4] 427,000	0.9	[5] 192,000	0.4	[5] 464,000	1.0
Transportation: Water	[6] 1,700	0.9	[6] 2,200	1.2	[7] 5,600	1.9	[7] 12,100	4.3	[8] 5,900	2.0	[8] 13,200	4.5	[9] 6,300	2.1	[9] 14,300	4.7	[10] 6,700	2.1	[10] 15,500	4.9
Rail	[6] 15,000	0.9	[6] 18,100	1.2	[7] 35,300	1.9	[7] 76,800	4.1	[8] 37,600	1.9	[8] 83,600	4.3	[9] 39,900	2.0	[9] 90,400	4.5	[10] 42,200	2.0	[10] 97,400	4.6
Other	[6] 10,200	0.9	[6] 13,100	1.2	[7] 40,900	2.1	[7] 88,900	4.5	[8] 43,600	2.1	[8] 96,800	4.7	[9] 46,200	2.2	[9] 104,700	4.9	[10] 49,200	2.2	[10] 112,500	5.1
Industry (Includes Construction)	[11] 126,700	1.0	[11] 163,500	1.3	[12] 396,000	2.6	[12] 715,000	4.8	[13] 424,000	2.7	[13] 800,000	5.1	[14] 460,000	2.8	[14] 890,000	5.5	[15] 497,000	2.9	[15] 985,000	5.8
Total	278,600	....	471,900	....	636,800	....	1,255,800	....	681,100	....	1,388,600	....	733,400	....	1,526,400	....	787,100	....	1,674,400	....
Agriculture Labor Force	[16] 40 million				[17] 51,000,000				[17] 50,000,000				[17] 49,000,000				[17] 48,000,000			
Employed Labor Force	[18] 27 million				[19] 35,000,000				[20] 36,500,000				[20] 38,000,000				[20] 39,600,000			

[1] The estimate is based on the total number of graduates to the end of 1937 from higher and middle educational institutes, from I. A. Lyasnikov, "Nekotorye Soobrazheniya o Potrebnosti S.S.S.R. v Spetsialistakh," *Vestnik Vysshey Shkoly*, Vol. vi, No. 4, 1948, p. 12, and on the percentage of graduates going to agriculture, from "Sotsialisticheskoe Stroitelstvo Soyuza S.S.R.," *Planovoe Khoziaistvo*, No. 8, 1939, p. 176. See also tabular data on the numbers of specialists in agriculture, *Op. cit.*, p. 170.

[2] Based on the number of graduates planned for the end of the present Five Year Plan, from Lyasnikov, cited above, and the projection of the percent going to agriculture from "Sotsialisticheskoe Stroitelstvo Soyuza S.S.R.," cited above, less the annual increment estimated from the same data.

[3] Based on the number of all graduates planned for the end of the present Five Year Plan, from Lyasnikov, and the projection of the percent going to agriculture, from "Sotsialisticheskoe Stroitelstvo Soyuza S.S.R."

[4] Is the 1950 estimate plus the projection of the annual increment.

[5] Is the 1950 estimate plus the projection of the annual increment for two years.

[6] Based on total employment in the branches of transportation from *Tretii Pyatiletnii Plan Razvitiya Narodnogo Khoziaistva S.S.S.R.*, 1939, the projection of the ratio of Inzhenerno-tekhnicheskikh rabotnikov (engineers and technicians) to total employment from *Trud v S.S.S.R.*, 1935, p. 227. The relationship of engineers to technicians within the Inzhenerno-tekhnicheskikh rabotnikov group is from Lyasnikov, p. 15, the figures being given for the year 1946, but believed applicable to 1937.

[7] Based on the number of graduates planned for the end of the present Five Year Plan, from Lyasnikov and the projection of the percent going to transportation and communication from "Sotsialisticheskoe Stroitelstvo S.S.S.R.," with the allocation of personnel within the transport and communications classification based on the projection of the allocation of total personnel in those fields shown for 1937 and 1942 in *Tretii Pyatiletnii Plan*, less the estimated annual increment allocated on the same basis.

[8] Based on the number of all graduates planned for the end of the present Five Year Plan and projection of percent going to transportation and communication, with the allocation within the transportation branches as in (7) above.

[9] Is the 1950 estimate plus the estimated annual increments.

[10] Is the 1950 estimate plus the projection of the annual increments for two years.

[11] Based on the total number of Inzhenerno-tekhnicheskikh rabotnikov (engineering and technical personnel) in industry and construction from *Tretii Pyatiletnii Plan*, allocated according to the percentage relationships within the group from Lyasnikov, p. 15.

[12] Based on the number of graduates planned for the end of the present Five Year Plan, Lyasnikov, the projection of the percent going to industry and construction from "Sotsialisticheskoe Stroitelstvo S.S.S.R.," less estimated annual increment.

[13] Based on number of graduates planned for end of Five Year Plan, and projection of percent going to industry and construction.

[14] Same methods as (4) above; i. e., 1950 estimate plus the annual increment. See also Lyasnikov, p. 15, for planned annual increments.

[15] Same methods as (5) above; i. e., 1950 estimate plus annual increments. See Lyasnikov.

[16] This figure is higher than that given by B. Babynin (34.7 million) "Trudovoye Resursy Kolkhozov i ikh ispol'zovanie," *Problemy Ekonomiki*, No. 2, 1940, 70 ff., taking into consideration the comment in the article that the figure there given was low, and allowing for the participation of those outside the 16–59 age groups there considered, and for the residue of private farmers. See also *Planovoe Khoziaistvo*, No. 8, 1939, p. 142, the results of the 1939 census quoted in the *Quarterly Bulletin of Soviet Russian Economics*, No. 5, 1940, and OSS, R & A, No. 2548, "The Soviet Labor Force; Wartime Changes and Postwar Prospects," confidential, 15 November 1944, p. 4.

[17] Projections of (16).

[18] Rounding of the employment figure given in *Tretii Pyatiletnii Plan*.

[19] ORR Report No. 4800, 7 June 1949, secret, p. 20.

[20] Estimates derived from the figure for 1949 plus the average annual percentage growth from 1933 through 1939, and from 1946 through 1948, averaged together to reduce the postwar bias.

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TABLE 2. U.S.S.R. ESTIMATE OF NUMBERS OF ENGINEERS AND SPECIALISTS IN VARIOUS BRANCHES OF LARGE-SCALE INDUSTRY

BRANCHES OF LARGE-SCALE INDUSTRY [1]	1937		1949		1950		1951		1952	
	WITH HIGHER EDUCATION	WITH MIDDLE EDUCATION	WITH HIGHER EDUCATION	WITH MIDDLE EDUCATION	WITH HIGHER EDUCATION	WITH MIDDLE EDUCATION	WITH HIGHER EDUCATION	WITH MIDDLE EDUCATION	WITH HIGHER EDUCATION	WITH MIDDLE EDUCATION
Electro-station	1, 600	2, 100	4, 700	9, 100	5, 200	10, 300	5, 500	11, 300	6, 000	12, 600
Fuel	8, 400	11, 700	29, 500	49, 700	31, 500	55, 800	34, 400	62, 000	37, 400	68, 900
Metallurgy	6, 400	8, 300	20, 400	35, 100	22, 000	39, 400	23, 900	43, 800	25, 900	48, 700
Machine Construction	38, 700	49, 900	126, 600	210, 300	136, 000	236, 100	147, 800	262, 300	160, 700	291, 500
Electro-technical	4, 500	5, 800	13, 400	26, 100	14, 400	29, 500	15, 600	32, 500	17, 000	36, 100
Ore Extraction	2, 400	3, 100	8, 700	12, 100	9, 500	13, 400	10, 200	15, 100	11, 100	16, 800
Chemical Industry	7, 400	9, 500	22, 100	42, 400	23, 600	47, 400	25, 800	52, 900	28, 000	58, 800
Mineral Extraction	1, 400	1, 800	5, 000	7, 900	5, 400	8, 500	5, 900	9, 800	6, 300	10, 900
Construction Materials	6, 500	8, 400	18, 400	38, 200	19, 700	42, 600	21, 500	47, 600	23, 300	52, 900
Textiles	6, 300	8, 100	18, 400	35, 800	19, 800	40, 400	21, 600	44, 600	23, 400	49, 600
Clothing	7, 600	9, 800	22, 100	43, 600	23, 900	48, 800	25, 800	54, 400	28, 100	60, 500
Household Goods	1, 100	1, 400	3, 000	6, 100	3, 300	7, 000	3, 500	7, 600	3, 800	8, 400
Objects for Culture	3, 200	4, 200	9, 700	18, 800	10, 300	20, 800	11, 300	23, 400	12, 300	26, 000
Food	10, 200	13, 100	26, 500	61, 200	28, 600	69, 200	30, 900	76, 400	33, 600	84, 800
Others	1, 800	2, 400	6, 400	9, 700	6, 800	10, 800	7, 400	12, 100	8, 100	13, 400
	108, 100	139, 500	335, 000	606, 000	360, 000	680, 000	391, 000	756, 000	425, 000	840, 000

[1] First, the engineers and technicians were allocated together to the branches of large-scale industry on the basis of the distribution of Inzhenerno-tekhnicheskikh rabotnikov shown in Trud v S.S.S.R., 1935, Table 17, pp. 74–83, and projected for the later years. Then the engineers and technicians were separated, for the year 1937, on the basis of the distribution within the Inzhenerno-tekhnicheskikh rabotnikov group shown in Lyasnikov, p. 15, for 1946. For the later years, the distribution of engineers relative to technicians in the various branches of industry is based on the distribution shown for the end of the current Five Year Plan in Lyasnikov, p. 15. For comparison, see GMDS document VII–66–c–12–44/198, "Problems der Industrialisierung Sowjet Russlands," Institut für Konjunkturforschung, which contains figures for the distribution of engineers and technicians in large-scale industry in 1925, 1928, and 1937.

Table 3

RESOURCES AND ALLOCATIONS OF TECHNICAL MANPOWER, USSR
(Middle and Higher Education)

REQUIREMENTS	1949	1950	1951	1952
I AGRICULTURE (total)	522,000	565,000	608,000	656,000
Tractors	[illegible]	[illegible]	[illegible]	[illegible]
General Equipment	[illegible]	[illegible]	[illegible]	[illegible]
II TRANSPORTATION (total)	259,600	280,700	301,800	323,500
Railroads	[illegible]	[illegible]	[illegible]	[illegible]
Motor	[illegible]	[illegible]	[illegible]	[illegible]
Inland Water	[illegible]	[illegible]	[illegible]	[illegible]
Pipe Lines	[illegible]	[illegible]	[illegible]	[illegible]
Civil Air	[illegible]	[illegible]	[illegible]	[illegible]
Shipping (Merchant Marine)	[illegible]	[illegible]	[illegible]	[illegible]
III INDUSTRY 1/	1,111,000	1,224,000	1,350,000	1,482,000
IV HOME USE	[illegible]	[illegible]	[illegible]	[illegible]
V MILITARY (total)	15,500	15,500	15,500	15,500
Army (Ground force weapons)	6,000 2/	6,000 2/	6,000 2/	6,000 2/
Air Force	5,000 2/	5,000 2/	5,000 2/	5,000 2/
Navy	4,500 2/	4,500 2/	4,500 2/	4,500 2/
Misc. Air Force weapons, ammunition, Ground and Air Force	[illegible]	[illegible]	[illegible]	[illegible]
VI TOTAL REQUIREMENTS	1,908,100	2,085,200	2,275,300	2,477,000
VII PRODUCTION	[illegible]	[illegible]	[illegible]	[illegible]
VIII IMPORTS	[illegible]	[illegible]	[illegible]	[illegible]
IX TOTAL AVAILABILITY	1,908,100	2,085,200	2,275,300	2,477,000
X SURPLUS	[illegible] 3/	[illegible] 3/	[illegible] 3/	[illegible] 3/
XI DEFICIT	[illegible]	[illegible]	[illegible]	[illegible]

1/ Includes Atomic Energy Requirements.
2/ The requirements for 1949 is static and there is consequently no additional need for 1950-1952.
3/ Requirements shown also indicate supply. Facilities for training as well as non-military and non-industrial scientific pool are estimated to be sufficient to meet requirements from year to year.

IX. ATOMIC ENERGY [1]

In the evaluation of the atomic energy requirements, it has been assumed in general that comparable elements in the Soviet and US programs exert comparable demands, except where intelligence information has warranted modifications. On this basis, the following is an estimate of the quantities of steel, aluminum, petroleum, electric power, and the engineer-technician manpower which will be required by the Soviet atomic energy program each year from 1949 to June 1952, inclusive.

DISCUSSION

Method of Analysis

The data of this report represent the most probable demands, as deduced from intelligence, of the Soviet atomic energy program upon Soviet industry. Since quantitative figures for manpower, electric power, and consumption of materials are not available directly from intelligence information, the estimates have been arrived at by a cumulative process; first, a decision as to what type of atomic energy production plants the Soviet will use and their probable time table of construction and operation; second, an examination of the requirements of comparable elements of our own program during 1943 to 1945, the period corresponding to the Soviet program from January 1949 to June 1952 (determined in the first step); and finally, modification of these requirements in accordance with the expected differences between the two programs. The basis for the intelligence decision necessary in the first and third steps is the latest JNEIC estimate of the Soviet atomic energy program.

Magnitude of Requirements

It must be emphasized that the Russian atomic energy program imposes primarily a qualitative, rather than a quantitative, strain on Soviet industry. Thus certain materials are needed with unusually high purity specifications, or with unusually close machining tolerances, or made of scarce alloy metals, and the consumption for atomic energy may be a large part of the total production within such restricted categories; but within the broad categories in this study (steel, aluminum, etc.), the atomic energy demands show up as small compared to the probable error in the total USSR consumption figures. For this reason, it has not been necessary to refine the estimates to a high degree of accuracy (and thereby to an accuracy not justified by intelligence information). Because of our uncertainty of the Soviet construction timetable, the estimates for any one year are more liable to be in error than the January 1949 to June 1952 totals.

Criterion for Requirements

The method employed in this report for deciding which plants should be considered as part of the Soviet atomic energy program has been to draw a line between installations which support directly the primary production units and those which contribute only indirectly. Illustrations of where this line falls are:

Moderator manufacture for atomic piles is included, but the manufacture of special steel is not.

Mining and ore processing are included, but the manufacture of mining equipment used is not.

1/ OSI/SR-10-49, "Status of the USSR Atomic Energy Project," dated 1 July 1949.

Personnel designing production units are included, but those designing plants to make equipment for atomic energy plants are not.

Steel passing through a factory and becoming equipment in a production plant is included, but the manpower and electric power used in such manufacture is not.

Plants producing nuclear weapons from nuclear explosives are included, but those producing electronic or mechanical parts for weapons are not.

Scientific researchers determining how to produce radioactive isotopes are included, but those investigating methods of using isotope tracers in industry are not.

It is assumed that an existing plant which is drawn into the atomic energy program within the criterion above in the period 1949-1952 constitutes a requirement, since the steel, manpower, etc., going into its makeup will presumably have to be replaced in the section of industry which is robbed. The steel, manpower, and electric power requirements of the Satellite countries for the furtherance of Russia's program are included.

Duplication of Other Data

It is not certain under what classification the Soviet allocations of steel, manpower, and electric power used in the atomic energy program will be made. For those plants which are under construction, however, it appears that allotments will be assigned directly to the ministries which are engaged in the construction of both the buildings and their equipment. For plants in operation, allotments may likewise be hidden within allocations to the operating ministries or to quasi-operating ministries (the MVD, for example, would be a likely nominee for the latter). In any case, for the purposes of this report it can be expected that the allocations destined ultimately for atomic energy have been included within the totals for many ministries and therefore will be included in the estimates prepared by the ORE "consumer committees" working on this study. And for all practical purposes consumption for atomic energy can be considered as included in the data of the committee on industry and home use consumption. Again it must be pointed out that the totals for atomic energy are less than the probable error in the totals for industry.

RESULTS

Data

The results of this study are tabulated below. The detailed assumptions and computations leading to these figures are not included as a part of this report, since they contain restricted data under the Atomic Energy Act, but they are available in NIB/OSI files. It should be noted that the consumption figures for 1952 are for a six month's period only.

Table 1. Estimated Consumption by Years

		1949	1950	1951	Jan-Jun 1952	Total Jan 49-Jun 52
Carbon Steel	(metric tons)	25,000	75,000	100,000	50,000	250,000
Stainless Steel	"	500	2,000	2,500	1,000	6,000
Aluminum	"					nil
Petroleum	"					nil
Electric Power		2.5	2.5	3.0	1.5	9.5 billion KWH

Table 2. Estimated Level of Manpower and Electric Power

	1949	1950	1951	Jan-Jun 1952
Peak Electric Power Demand	375,000	375,000	550,000	550,000 KWH
Peak Professional Manpower for Construction	1,000	2,000	2,000	1,000
Peak Professional Manpower for Operation *	12,000	9,000	9,000	9,000

* This classification includes scientific manpower, which represents roughly one-fifth of the totals given.

Discussion of Data

The largest proportionate requirement is that for electric power consumption, which at its peak may draw about 3 percent of the total Soviet production. The peak rate of electric power consumption is likewise about 3 percent of total capacity. Professional manpower in its peak year will be about 2 percent of the total in the USSR, although the demand for construction engineers may reach about 5 percent of the total of that group. Scientific manpower is included in the data, comprising about one-fifth of the totals of professional operational personnel. Steel consumption will be less than 1 percent, and aluminum and petroleum demands are negligible. The major demands for steel and manpower occur during the construction of plants. Replacement and maintenance will not draw noticeable amounts in these two categories during the period covered by this report. Practically all the electric power consumption, on the other hand, will go into operation of plants.

In connection with the above estimate, it is to be particularly emphasized that the basis for determining the extent, direction, and time scale of the Soviet atomic energy program has been the latest JAEIC estimate of the Soviet program, published in OSI/SR-10-49, 1 July 1949. It is concluded that the total quantities estimated to be consumed over the entire period from January 1949 to June 1952 represent a reasonable order of magnitude for the Soviet program during this period. It must be emphasized, however, that the estimates for each year separately may be considerably in error and that deductions about the Soviet atomic energy timetable may therefore be quite erroneous. Soviet allocations to the atomic energy program cannot be distinguished from allocations to other elements of industry and for the present purpose are included within the quantities reported for industry.

T O P S E C R E T

X. MILITARY

SOVIET CAPABILITIES AND COURSES OF ACTION, 1952

The Problem: Military Requirements for Steel and Aluminum, Petroleum, and Technical Manpower

A. Soviet Ground Forces, 1949 - 1952

Chart I
Chart II (4 sections)
Chart III

B. Soviet Air Forces, 1949 - 1952

Annexes I - III

C. Soviet Navy, 1949 - 1952

Tables I - V

Note: The material for the several parts of this section have been supplied by the Departments of the Army, the Air Force, and the Navy, respectively.

T O P S E C R E T

A. SOVIET REQUIREMENTS IN STEEL, ALUMINUM, POL, AND MANPOWER FOR GROUND FORCES

1. Statement Of The Problem

To prepare an estimate of the Soviet Ground Force requirements during the period 1949-1952 for:

a. Raw Steel (ingot)
b. Raw Aluminum (ingot)
c. POL
d. Technical Manpower

2. Facts Bearing On The Problem

a. It must be emphasized that firm information is not available in any single phase of the Soviet munitions industry. The basic figures on which this study is based are the estimated inventories, by types of equipment, in hands of troops (Chart I, and first column, Chart II). While this estimate in itself is not firm, it is, nevertheless, an appraisal of one subject concerning which a fair amount of information is available.

b. The estimates included in the columns which follow the first one in Chart II*, are all conjectural. The best that can be said about these estimates is that they reflect an effort to compute a balanced picture of the production requirements of the Soviet Ground Forces, in addition to the procurement needs of weapons and vehicles (excluding aircraft) of the Air Force. These estimates project requirements both for current needs (equipment in hands of troops) and projected future needs (equipment in storage).

c. The estimates of the study are based on the following four assumptions:

(1) Peace in the form of the present "Cold War" will prevail during the 4-year period under study, i.e. 1949-52;
(2) The size of the Soviet Ground Forces will not increase during this period;
(3) The Soviet production of munitions during this period is designed primarily for maintenance of equipment in hands of troops with only a moderate allowance for annual increments. Exceptions to this general rule have been made only for such standard weapons in which there is a need for expanding production, such as AA guns, aircraft MG, and aircraft cannon. Allowance has also been made for a slight annual increase of POL and truck requirements of the Ground Forces, in both categories of which there are at present apparent deficiencies. The estimates of Soviet munitions production do not include production in Satellite countries.

* An abbreviated summary of the worksheets from which the total steel and aluminum requirements of the Soviet munitions industries have been derived.

(4) With the exceptions noted above (3,c.), the volume of currently held equipment, as itemized in this study (first and second columns, Chart II), is sufficient for equipping 300 Ground Forces divisions. Since most of this equipment represents estimated stocks on hand at the end of World War II, production of new equipment can be kept to a minimum, and will remain the same during the four years here considered.

3. Conclusions

a. Annual Steel and Aluminum Requirements, 1949-52

The annual steel and aluminum requirements of the Soviet munitions industries serving the Ground and Air Forces (excluding aircraft), 1949-52, remain approximately the same for each of the four years. Total steel ingot requirements are estimated at 2,165,000 metric tons per year, and aluminum ingot at 4,300 tons per year. Table 1 gives a summary breakdown analysis of these figures, while a detailed breakdown is found in Chart II.

Table 1

ANNUAL STEEL AND ALUMINUM REQUIREMENTS OF THE SOVIET MUNITIONS INDUSTRIES FOR GROUND AND AIR FORCES (EXCLUDING AIRCRAFT), 1949-52

Category	STEEL Metric Tons		ALUMINUM Metric Tons	
	Net Weight*	Ingot	Net Weight*	Ingot
Ground Forces, Weapons	352,000	1,007,000	2,340	3,300
Air Force, Weapons	270	1,000	1	3
Miscellaneous	105,000	300,000	540	1,000
Ammunition, Ground & Air Forces	300,000	857,000	-	-
Grand Total:	757,000 (rounded)	2,165,000	2,840 (rounded)	4,300 (rounded)

* Because the estimates are based on net weights of equipment, this total is included for sake of comparison with the ingot volumes. The term "net weight" represents actual weight of total end items as they leave the factory.

b. POL and Diesel Fuel Requirements, 1949-52

The annual POL and Diesel Fuel Requirements for the Armed Forces (except Navy), excluding aviation gasoline, are computed as follows:

Table 2

ESTIMATED TOTAL POL AND DIESEL FUEL CONSUMPTION REQUIREMENTS FOR THE SOVIET ARMY, AIRFORCE, MVD, AND PVO, EXCLUDING AVIATION GASOLINE, 1949-52

In thousands of Metric Tons

Year	POL		DIESEL FUEL	
	Total	Army % of total	Total	Army % of total
1949	1,443	72	222	84
1950	1,463	72	234	85
1951	1,493	73	243	85
1952	1,512	73	253	86

For detailed breakdown of POL and Diesel fuel requirements, see Chart III.

c. Technical Personnel Requirements

The number of technical personnel currently required by the Soviet Ground Forces is estimated to be 6,000. No figures are available on which to base an estimate of annual reduction of this total through retirements and deaths. About 900 students are graduated each year from technical institutes for service with the Ground Forces. It should be noted, however, that many of the graduates from military technical institutes are assigned from the technical services for refresher courses and graduate study. The actual increase of the technical personnel is, therefore, considerably smaller than indicated by the total of 900 graduates per year.

4. Discussion

a. Steel and Aluminum Requirements for Ground and Air Force Munitions Industries

(1) Net Weight, Basis for Estimates

In arriving at the total annual tonnage requirements for steel and aluminum, the only fairly firm figures used in the statistical analysis are those of the actual net weights of steel and aluminum in the end products produced. (Examples: kilograms of steel per rifle, per each 203 mm How, per truck, etc.). These figures, multiplied by the estimated items of production, by types of equipment, and added together, have given the total annual volume of steel and aluminum in terms of net weight. Similarly, the annual percentage of depletion of equipments in hands of troops, which are itemized in Chart II, applied against the total inventory

of equipment in hands of troops, has given the annual total number of items depleted. This figure subtracted from the annual production, has given the estimate of yearly increment in terms of numbers of items. No depletion rate has been assigned to equipment in storage.

Additional quantities of steel and aluminum are, however, required for the overhaul of inventory both in hands of troops and in storage. Starting with an estimate of percent of inventory which has to be overhauled, this percentage has been translated in terms of total number of items. This latter number has been multiplied by the estimated weight of replacement required per item in terms of steel and aluminum. Thus, the total steel and aluminum requirements have been obtained by adding the separate net weights of new production and the two categories of overhaul requirements.

This process of calculation has given what is considered to be a fairly accurate estimate of the net weight, i.e. the actual weight of steel and aluminum in end items of munitions as they leave the factory.

Special mention should be made of the third section of Chart II, "Miscellaneous". This category, which takes in odds and ends difficult to itemize, has been arbitrarily estimated at 30 percent of the total net weight of weapons (sections 1 and 2, Chart II) of the Ground and Air Forces. This is about 10 percent less than similar estimates of requirements employed in United States ordnance computations, and it has been done on the assumption that pipe lines, which always comprise a heavy steel item in United States military requirements, are far less important in the U.S.S.R. Also, while United States ordnance planners must allot a considerable quantity of spare parts for any given weapon, the Soviets generally return equipment needing overhaul directly to the factory, thus reducing the need of spare parts.

(2) Gross Weight, Steel and Aluminum Ingots

In order to project the net weight figures in terms of total Soviet production requirements, it has been necessary to translate the total net weight in terms of steel and aluminum ingot. The best figures available to United States intelligence on Soviet production are given in terms of steel and aluminum ingot production. For instance, the 1948 steel ingot production has been estimated at 17,000,000 metric tons. From this it is readily seen that the net weight figures, which necessarily form the starting point of these types of estimates, are quite useless for the purpose of this study unless they can be converted into ingot figures.

The ingot requirements are determined by the rate of losses in scrap during the various stages of manufacture from the ingot to the rolled product (average approximately 25-28 percent scrap loss in the United States steel industry; estimated at 35 percent in the U.S.S.R.), and thence to manufacturing plants in which rolled products, strips and bars are processed into their final end items. Since we have no detailed information available on the wastage rate in the Soviet steel and aluminum manufacturing industries, arbitrary figures of 65 percent of total steel ingot and 45 percent of aluminum ingots have been assigned as the average scrap losses in the Soviet munitions industries. For comparison it might be mentioned that

the scrap loss in the United States from steel ingot to end product is no less than 64 percent for a 57 mm AT gun, 51 percent for a 4.5 inch field gun, and as high as 82 percent in certain special-purpose weapons. The average current scrap loss in the United States is 42 percent for small arms, ammunition, artillery, vehicles, and tanks. It should be noted, however, that these scrap losses were considerably higher at the beginning of World War II and have been reduced only as a result of intensive research and technological improvements in the course of World War II. Another comparison used in assigning 65 percent as the average scrap loss in the U.S.S.R. is the Bofors plant in Sweden, where the scrap loss is on an average 65 percent in the production of artillery. A specific example of the scrap loss in a Soviet plant (Kramatorsk metallurgical plant) indicates that the scrap loss is at least 65 percent.

Thus, although it is believed that the figure 65 percent steel scrap is conservative when applied to the Soviet munitions industry, it is by no means a firm figure. The scrap percentage (45%) assigned to Soviet aluminum manufactures is slightly higher than that of the United States industry.

b. POL

The calculations leading to the estimates of POL and Diesel fuel consumption of the Soviet Ground, Air, MVD, and PVO Forces as given in Chart III, were based on the following factors:

(1) Number of vehicles actually used by administrative and tactical organizations;
(2) Number of miles travelled per vehicle in winter (5 months), and in good weather (7 months);
(3) Number of gallons per mile, per vehicle (8 miles per vehicle).

By applying these factors an estimate was obtained of the motor fuel consumption of the Soviet Ground Forces, etc. The amount of lubricants required is considered to be 10 percent of the motor fuel consumed. Additional gasoline required for miscellaneous purposes is estimated to equal five percent of the total motor fuel requirements. Similar methods have been used in estimating the Diesel Fuel requirements.

It should be pointed out that it has been estimated that there will be a slight annual increase in the amount of gasoline and lubricants required for the Ground Forces from 1949 through 1952 as the number of vehicles now assigned to the Ground Forces is below T/E requirements and is therefore expected to increase. No increase is anticipated for the Air Force, the MVD, and PVO.

c. Technical Personnel

Technical personnel is defined as that personnel required to staff estimated military organizations. It does not include skilled workers, but only the professional engineer-technician groups.

The number of technical personnel currently required by the Soviet Ground Forces is estimated to be 6,000. It is considered that the T/O positions are filled, but that a portion of the positions are occupied by technicians who were given accelerated courses during World War II. No information is available on which to base an estimate of the annual reduction through retirements and deaths. The estimated requirements are broken down as follows:

Table 3

ESTIMATED REQUIREMENTS OF TECHNICAL PERSONNEL OF THE SOVIET GROUND FORCES

Armies and Military Districts	3,000
Assigned to factories	1,500
Assigned to Ministry of Armed Forces	500
Assigned to special projects	400
Headquarters, occupation forces	200
On loan to satellite armies	100
Faculties of academies	300
Total	6,000

The annual number of graduates of technical personnel for the Ground Forces is estimated to be 900, comprising 775 from military institutes and 125 from universities. The military institutes, with estimates of annual graduates are given below in Table 4. It should be noted that many of the graduates from military technical institutes are assigned from the technical services for refresher courses and graduate studies. The total of 900 graduates per year may, therefore, be considerably higher than the actual net gain of new technicians. It should also be noted that schools other than those mentioned in Table 4 train officers for operational commands in signal, engineering, artillery, etc.

Table 4

HIGHER TECHNICAL INSTITUTES OF THE SOVIET GROUND FORCES

Name of Institute	Number of Annual Graduates
Budenny Electro Technical (Signal) Academy	150
Kuibyshev Engineering Academy	150
Dzerzhinski Artillery Academy	75
Kaganovich Transportation Academy	150
Molotov Quartermaster Academy	50
Stalin Tank and Mechanized Academy	75
Voroshilov Academy of Chemical Defense	125
TOTAL	775

CHART I

ESTIMATE OF EQUIPMENT IN HANDS OF TROOPS, SOVIET GROUND FORCES (EXCLUDING MVD AND PVO)

Type of Equipment	Ministry and 21 MD's	4 Gps of Forces Eq	24 Army Eq	55 Corps Eq	65 Rifle Div (OT)*	40 Rifle Div (NT)**	20 Tk Div	35 Mcq Div	15 Cav Div	30 AAA Div	20 Arty Div	9 Hv Arty Brig	15 Med Gun Brig	19 RL Brig	30 Tk Regt	60 How Regt	15 Gun How Regt	60 TD Regt	20 A/B Brig	60 AT Regt	60 Mort Regt	30 SPG Regt	60 Engr Brig	Totals	Type of Equipment
Pistols	2,000	400	1,200	2,700	52,000	44,000	21,000	45,000	4,500	12,000	18,000	2,100	5,000	2,000	3,900	6,000	1,500	3,000	8,000	1,200	3,000	1,500	9,000	249,000	Pistols
Rifles and carbines	8,500	1,600	4,000	5,600	360,800	248,200	113,000	258,300	44,100	46,300	158,100	12,600	20,900	29,000	20,100	51,200	12,800	27,000	63,000	2,400	35,700	4,900	50,000	1,566,000	Rifles and carbines
SMG	11,000	2,000	6,000	8,200	159,300	93,300	27,500	79,600	19,000	13,700	24,300	2,800	4,600	4,500	15,000	10,100	2,500	3,000	21,000	7,200	2,500	8,100	35,000	560,000	SMG
LMG	700	200	400	500	34,000	27,000	19,000	32,000	2,600		2,900	200	300	600	700	1,100	250	700	2,600	500	1,100	300	2,500	130,150	LMG
HMG	200	100	100	200	8,775	6,480	2,460	5,145	720						600				960					25,740	HMG
AAMG					1,170	2,160	1,160	2,050	135	1,920	480	100	200	285	300	200	50							10,190	AAMG
82 mm Mort					9,055	3,240	1,040	2,870	540						180				1,200					18,105	82 mm Mort
120 mm Mort					1,365	720	720	1,890	180		2,160								80		1,080			8,195	120 mm Mort
160 mm Mort						480															1,080			1,560	160 mm Mort
37 mm AAG						720	440	770	90	1,440				228					80					3,840	37 mm AAG
57 ATG					3,250	1,440	560	1,120	180						60				320					6,950	57 ATG
76 How						780			180										160					1,120	76 How
76 Gun					1,560	960	240	1,260	180		1,440							1,440						7,080	76 Gun
76 SPG						720																		720	76 SPG
85 AAG										960														960	85 AAG
85 ATG						480																		480	85 ATG
100 ATG																				720				720	100 ATG
100 SPG						640														480		650		1,770	100 SPG
122 Gun											240		180											420	122 Gun
122 How					780	1,440	240	840			960					1,440								5,700	122 How
122 SPG																						650		650	122 SPG
132 mm RL (M13)							240	420						912										1,572	132 mm RL (M13)
152 mm How											480					720								1,200	152 mm How
152 mm Gun-How											480		360				540							1,380	152 mm Gun-How
152 mm SPG							420	1,470														650		2,540	152 mm SPG
203 How												72												72	203 How
210 Gun												48												48	210 Gun
280 How												48												48	280 How
305 How												48												48	305 How
T/54 Tk						2,080	4,100	4,850							1,625									12,635	T/54 Tk
JS Tk							880	805							325									2,010	JS Tk
Armd cars						360	600	1,365							210									2,535	Armd cars
Armd carriers															270									270	Armd carriers
Trucks	50,000	5,000	48,000	4,125	42,250	52,000	27,200	65,765	1,500	8,520	14,500	3,285	2,865	4,180	2,700	5,280	1,300	5,040	6,000	1,440	3,840	1,410	5,400	361,600	Trucks
Tractors	1,600				1,950	1,800	300	1,050			2,000	450	600			1,500	600						720	12,570	Tractors
Motorcycles						9,360	5,800	10,150			580			80	600			240	300			200	720	28,030	Motorcycles
M-dr Vehs						38,000			6,060															44,060	M-dr Vehs
Kitchens	175	27	96	110	4,550	3,000	1,700	3,800	525	600	1,800	150	255	180	1,560	660	160	480	650	300	300	80	900	22,058	Kitchens
Radios	1,500	50	400	250	3,900	4,800	4,200	9,000	950	1,230	6,000	600	990	880	1,530	2,220	550	1,680	2,000	900	960	330	2,500	47,400	Radios

NOTES: 1. Numbers of military district, group, corps, and army headquarters, and of rifle, tank, and mechanized divisions are based on reasonably good order of battle estimates. Numbers of AAA and artillery divisions, heavy artillery brigades, and other organizations have been assigned on the basis of the numbers required to fill out a balanced Ground Force.

2. T/E requirements of the rifle, tank, mechanized, and AAA divisions are based on postwar evidence. World War II T/E requirements of the other tactical organizations have been used; it is felt that postwar changes in the T/E's of those units would entail a negligible difference in weights of metals.

* Old type.

** New type.

CHART II **TOP SECRET**

U.S.S.R. STEEL AND ALUMINUM REQUIREMENTS FOR GROUND AND AIRFORCE WEAPONS AND AMMUNITION*

I GROUND FORCES ([redacted] AND AIR FORCES)

1 January 1949

Type of Equipment	INVENTORY: In hands of troops (Items)	INVENTORY: In storage (Items**)	NEW PRODUCTION PER YEAR: Items	NEW PRODUCTION PER YEAR: Steel MT	NEW PRODUCTION PER YEAR: Aluminum MT	DEPLETION: % of Eqmt in hands of troops	DEPLETION: Items	YEARLY INCREMENT: Items	OVERHAUL OF INVENTORY IN HANDS OF TROOPS: % of Inventory	OVERHAUL OF INVENTORY IN HANDS OF TROOPS: Total Items	OVERHAUL OF INVENTORY IN HANDS OF TROOPS: Total Steel MT	OVERHAUL OF INVENTORY IN HANDS OF TROOPS: Total Aluminum MT	OVERHAUL OF INVENTORY IN STORAGE: % of Inventory	OVERHAUL OF INVENTORY IN STORAGE: Total Items	OVERHAUL OF INVENTORY IN STORAGE: Total Steel MT	OVERHAUL OF INVENTORY IN STORAGE: Total Aluminum MT	TOTAL REQUIREMENTS: Steel**** MT	TOTAL REQUIREMENTS: Aluminum MT
Pistols	304,000	300,000	25,000	19.8***	0	4	12,160	12,840	5	15,200	3.4	0	0.5	1,500	.34	0	24	0
Rifles (Carbines)	1,676,000	3,250,000	423,000	1,341.0***	0	3	50,280	372,720	5	83,800	76.02	0	10.0	825,000	294.8	0	1,712	0
SMG	835,000	1,500,000	85,000	289 ***	0	3	25,050	59,950	5	41,750	18.9	0	0.5	7,500	3.4	0	311	0
LMG	141,150	200,000	9,000	10.7***	0	2	2,823	6,177	6	8,469	15.36	0	20.0	40,000	72.6	0	99	0
HMG	27,740	60,000	7,000	25.4***	0	2	554	6,445	6	1,664	3.02	0	0.5	300	.54	0	29	0
AAMG	10,190	40,000	6,000	10 ***	0	2	204	5,796	6	611	2.77	0	0.5	200	.9	0	14	0
82 Mortar	22,105	35,000	1,500	405	0	2	442	1,058	4	884	22.05	0	0.5	175	4.4	0	432	0
120 Mortar	8,695	23,800	1,500	675	0	2	174	1,326	4	348	31.55	0	0.5	119	10.7	0	717	0
160 Mortar	1,660	6,400	2,000	1,800	0	2	33	1,967	4	66	12.05	0	0.5	32	5.8	0	1,818	0
37 AA Gun	10,840	18,000	500	1,135	4.5	1	108	392	5	542	110.63	.49	0.5	90	18.3	.08	1,264	5.03
57 AT Gun	6,930	15,000	500	520	4.5	1	69	431	5	347	35.36	.16	0.5	75	7.7	.03	563	4.63
76 How.	1,120	7,900	600	360	0	1	11	589	5	56	8.89	0	0.5	40	6.27	0	375	0
76 Gun	8,080	18,000	800	896	0	1	81	719	5	404	174.09	0	0.5	90	38.78	0	1,109	0
76 AA Gun	2,000	3,000	Not Prod.	0	0	2	40	None	8	160	159.6	.36	.5	15	14.9	.034	175	.39
76 SP Gun	720	4,800	Not Prod.	0	0	6	43	None	18	130	176.35	1.175	0.5	24	32.6	.22	209	1.47
85 AA Gun	5,960	11,000	700	3,178	0	1	60	640	5	298	540.68	.68	0.5	55	99.7	.12	3,818	.86
85 AT Gun	480	1,900	800	1,816	0	1	5	795	5	24	43.5	.05	0.5	10	17.2	.02	1,877	.43
100 AT Gun	720	1,300	800	2,536	0	1	7	793	5	36	65.3	.08	0.5	7	11.7	.015	2,613	.60
100 SP Gun	1,770	1,080	960	27,840	480	6	106	854	18	319	578.06	4.33	0.5	15	9.79	.07	28,428	484.33
105 AA Gun	1,000	500	1,000	14,500	0	1	10	990	5	50	106.59	.11	0.5	3	5.3	.005	14,612	15.07
122 Gun	420	3,580	200	1,270	0	1	4	196	5	21	50.48	.047	0.5	18	43	.04	1,363	1.27
122 How.	5,700	14,300	200	454	0	1	57	143	5	285	213.3	.646	0.5	72	53.5	.16	721	2.19
122 SP Gun	650	3,000	420	19,446	21	6	39	381	18	117	318.4	2.1	0.5	15	40.8	.27	19,805	23.1
132 RL (M 13)	1,572	3,000	200	726	4.6	1	16	184	5	79	35.65	0	0.5	15	6.8	0	768	4.6
152 How.	1,200	8,800	50	170	0	1	12	38	5	60	70.49	.136	0.5	44	51.6	.009	292	.17
152 Gun-How.	1,380	4,600	50	340	0	1	14	36	5	69	166.2	.156	0.5	23	55.3	.05	562	.52
152 SP Gun	2,540	1,460	420	19,446	21	6	152	268	18	457	1,244.3	8.29	0.5	7	19.8	.13	20,711	29.29
203 How.	72	425	30	516	0	0.5	0	30	2.5	2	8.8	.004	0.5	2	10.2	.005	535	.24
210 Gun	48	250	30	1,224	0	0.5	0	30	2	1	5.7	.02	0.5	1	7.48	.03	1,237	.4
280 How.	48	200	10	182	0	0.25	0	10	2	1	6.5	.02	0.5	1	6.8	.02	195	.1
305 How.	48	150	10	408	0	0.25	0	10	2	1	7.8	.02	0.5	1	6.1	.02	422	.1
T-34 Med Tk	12,635	18,400	3,600	114,480	180	6	758	2,842	18	2,274	4,126	31	0.5	92	167	1.25	118,773	212.25
JS Hvy Tk	2,010	3,000	600	27,780	30	6	121	479	18	362	984.66	6.56	0.5	15	40.8	.03	28,805	36.59
Armored Car	2,735	1,000	Not Prod.	0	0	6	164	None	10	274	24.8	.62	0.5	5	.4	.01	25	.63
Armored Carrier	270	1,000	Not Prod.	0	0	6	16	None	18	48	4.4	.11	0.5	5	.4	.01	5	.12
Trucks	266,600	145,000	30,000	81,600	690	6	15,996	14,004	12	31,992	1,451.1	72.5	0.5	725	32.8	1.6	83,084	764.1
Tractors	12,570	1,200	1,200	9,840	27.6	6	754	446	18	2,263	2,052.62	15.39	0.5	6	5.4	.04	11,898	43.01
Motorcycles	29,030	40,000	5,000	2,500	25	6	1,742	3,258	10	2,903	26.5	.66	0.5	200	1.8	.05	2,528	25.71
Horsedrawn Vehicles	44,060	10,000	800	72	0	1	440	360	3	1,320	5.99	0	0.5	50	.22	0	78	0
Kitchens	25,058	25,000	500	90	25	1	251	249	1	251	11.4	5.68	0.5	125	5.6	2.8	107	33.6
Radios	57,400	60,000	5,000	25	115	5	2,870	2,130	20	11,480	0	26.04	0.5	300	0	.68	25	141.68
															Net Weight (Rounded Totals)		352,000	1,800
															Scrap-65% of Steel and 45% of Aluminum Gross		655,000	1,472
															Gross (Ingot)		1,007,000	3,272
II AIR FORCES																		
Pistols	191,428	380,000	15,000	11.9***	0	4	7,657	7,343	5	9,571	.5	0	0.5	1,900	0.43	0	14	0
Rifles (Carbines)	64,030	130,000	12,000	38 ***	0	3	1,921	10,079	5	3,202	2.0	0	10.	13,000	11.8	0	53	0
SMG	13,770	30,000	15,000	51 ***	0	3	413	13,357	5	689	1.0	0	.5	150	.068	0	51	0
LMG	1,709	3,500	1,000	1.19***	0	2	34	966	6	103	4.0	0	20	700	1.27	0	4	0
HMG	204	500	100	.36***	0	2	4	96	6	12	4.0	0	.5	2.5	.005	0	0	0
7.62 AC MG	9,900	20,300	3,000	3.6***	0	2	198	2,802	6	594	4	0	20	4,060	7.37	0	12	0
12.7 mm AC MG	25,000	50,000	4,000	4.8***	0	2	500	3,500	6	1,500	4	0	20	10,000	18.1	0	26	0
20 mm AC	13,000	30,000	1,500	10.9***	0	2	260	1,240	6	780	8	0	.5	150	.54	0	14	0
23 mm AC	12,000	30,000	1,500	10.9***	0	2	240	1,260	6	720	8	0	.5	150	.54	0	14	0
53 mm AC	500	400	100	78	.7	1	5	95	5	25	169	.75	.5	2	.15	.0007	80	.76
															Net Weight (Rounded Totals)		270	1
															Scrap-65% of Steel and 45% of Aluminum Gross		500	2
															Gross (Ingot)		770	3
III MISCELLANEOUS																		
Estimated to be 30 percent of the total weight of weapons for Ground and Air Forces															Net Weight (Rounded Totals)		105,000	540
															Scrap-65% of Steel and 45% of Aluminum Gross		195,000	442
															Gross (Ingot)		300,000	982
IV AMMUNITION FOR GROUND AND AIR FORCES																		
Ammunition			300,000	0														
															Net Weight (Rounded Totals)		300,000	0
															Scrap-65% of Steel and 45% of Aluminum Gross		557,000	0
															Gross (Ingot)		857,000	0
															GRAND TOTAL: NET WEIGHT		757,270	2,341
															SCRAP		1,407,500	1,916
																	2,164,770	4,257

* Data and equipment in hands of Air Force troops have been supplied by A-2. Steel and aluminum requirements for each item, production, and storage inventories are I.D. estimates. While the steel and aluminum requirements for each item are believed to be reasonably accurate, estimates of production and storage inventories are conjectural.

** Considered to include weapons in permanent inland (non-naval) fortifications.

*** Per 1,000 units.

**** Decimals have been eliminated in giving the totals in steel requirements by type of equipment.

I GROUND FORCES (INCLUDING MVD AND PVO)

U.S.S.R. STEEL AND ALUMINUM REQUIREMENTS FOR GROUND AND AIRFORCE WEAPONS AND AMMUNITION

1 January 1950

Type of Equipment	INVENTORY		NEW PRODUCTION PER YEAR			DEPLETION		YEARLY INCREMENT	OVERHAUL OF INVENTORY IN HANDS OF TROOPS				OVERHAUL OF INVENTORY IN STORAGE				TOTAL REQUIREMENTS	
	In hands of troops Items	In storage ** Items	Items	Total Steel MT	Aluminum MT	% of Eqpt in hands of troops	Items	Items	% of Inventory	Items	Total Steel MT	Aluminum MT	% of Inventory	Items	Total Steel MT	Aluminum MT	Steel MT ****	Aluminum MT
Pistols	304,000	312,840	85,000	19.8***													24	0
Rifles (Carbines)	1,676,000	3,622,720	423,000	1,341 ***	0	4	12,160	12,840	5	15,200	3.4	0	.5	1,564	.35	0	1,746	0
SMG	835,000	1,569,950	85,000	289 ***	0	3	25,050	372,720	5	83,800	76.02	0	10.	362,272	328.65	0	511	0
LMG	141,150	206,177	9,000	10.7***	0	3	2,823	59,950	5	41,750	18.9	0	.5	7,800	3.54	0	101	0
HMG	27,740	66,445	7,000	25.4***	0	2	555	6,177	6	8,469	15.36	0	20.	41,236	74.8	0	29	0
AAMG	10,190	45,796	6,000	10 ***	0	2	204	6,445	6	1,664	3.02	0	.5	332	.6	0	14	0
82 Mortar	22,105	36,058	1,500	405	0	2	442	5,796	6	611	2.77	0	.5	229	1.04	0	432	0
120 Mortar	8,695	25,126	1,500	675	0	2	174	1,058	4	884	22.05	0	.5	180	4.5	0	718	0
160 Mortar	1,660	8,367	2,000	1,800	0	2	33	1,326	4	348	31.55	0	.5	126	11.4	0	1,820	0
37 AA Gun	10,840	18,392	500	1,135	4.5	1	108	1,967	4	66	12.05	0	.5	42	7.6	0	1,264	0
57 AT Gun	6,950	15,431	500	520	4.5	1	69	392	5	542	110.65	.49	.5	92	18.8	.08	563	0
76 Rcv.	1,120	8,489	600	560	0	1	11	451	5	347	35.36	.16	.5	77	7.9	.04	576	0
76 Gun	8,000	18,719	800	896	0	1	81	589	5	56	8.89	0	.5	42	6.7	0	1,110	0
76 SP Gun	720	4,727	Not Prod.	0	0	6	43	719	5	404	174.09	0	.5	93	40.3	0	209	0
76 AA Gun	2,000	2,960	Not Prod.	0	0	2	40	None	18	130	176.35	1.173	.5	24 &	32.4	.22	174	0
85 AA Gun	5,960	11,640	700	3,178	0	1	60	None	8	160	159.6	.36	.5	14.8	14.76	.03	3,824	0
85 AT Gun	480	2,695	800	1,816	0	1	5	640	5	298	540.68	.68	.5	58	105.6	.13	1,884	0
100 AT Gun	720	2,795	800	2,336	0	1	7	795	5	24	43.5	.05	.5	14	24.5	.03	2,627	0
100 SP Gun	1,770	1,954	960	27,840	480	6	106	795	5	36	65.3	.08	.5	14	25.2	.03	28,436	480
105 AA Gun	1,000	1,490	1,000	14,500	0	1	10	854	18	319	578.06	4.33	.5	10	17.6	.13	14,628	0
122 Gun	420	3,776	200	1,270	0	1	4	990	5	50	106.89	.11	.5	8	16	.02	1,566	0
122 Rcv.	5,700	14,443	200	454	0	1	57	196	5	21	50.48	.047	.5	19	45.43	.04	1,566	0
122 SP Gun	650	3,381	420	19,446	21	6	39	143	5	285	213.3	.646	.5	72	54	.16	721	0
132 RL (M 13)	1,572	3,184	200	726	4.6	1	16	381	18	117	318.4	2.1	.5	17	46	.31	19,810	23
152 Rcv.	1,200	8,858	50	170	0	1	12	184	5	79	35.65	0	.5	16	7.2	0	769	0
152 Gun-How.	1,380	4,656	50	340	0	1	14	38	5	60	70.49	.14	.5	44	51.9	.1	292	0
152 SP Gun	2,540	1,728	420	19,446	21	6	152	36	5	69	166.2	.156	.5	23	55.9	.05	562	0
203 Rcv.	72	455	30	516	0	.5	0	268	18	457	1,244.3	8.29	.5	9	23.4	.16	20,714	29
210 Gun	48	280	30	1,224	0	.5	0	30	2.5	2	8.8	.004	.5	2	11.2	.005	556	0
280 Rcv.	48	210	10	182	0	.25	0	30	2	1	5.7	.02	.5	1	8.4	.03	1,238	0
305 Rcv.	48	160	10	408	0	.25	0	10	2	1	6.5	.02	.5	1	7.1	.024	196	0
T-54 Med. Tk	12,655	21,242	3,600	114,480	180	6	758	10	2	1	7.8	.02	.5	1	6.5	.018	422	0
JS Hvy Tk	2,010	3,479	600	27,780	30	6	121	2,842	18	2,274	4,126.0	31.0	.5	106	192.7	1.4	118,799	212
Armored Car	2,755	836	Not Prod.	0	0	6	16	479	18	362	984.66	6.56	.5	17	47.4	.3	28,812	36.86
Armored Carrier	270	98	Not Prod.	0	0	6	16	164	None	10	274	24.8	.62	.5	4	.38	25	0
Trucks	282,600	143,004	30,000	81,600	690	6	16,956	None	18	49	4.4	.11	.5	5	.44	.01	5	0
Tractors	12,570	1,646	1,200	9,840	27.6	6	754	13,044	12	33,912	1,538.2	76.91	.5	715	32.4	1.6	85,171	768
Motorcycles	29,050	43,258	5,000	2,500	25	6	1,742	446	18	2,262	2,052.62	15.39	.5	8	7.4	.06	11,900	43.35
Horsedrawn Vehicles	44,060	10,360	800	72	0	1	440	3,258	10	2,903	26.3	.66	.5	216	1.96	.05	2,528	0
Kitchens	25,058	25,249	500	90	25	1	251	360	3	1,322	6	0	.5	52	.24	0	78	0
Radios	57,400	62,150	5,000	25	115	5	2,870	249	1	251	11.4	5.68	.5	126	5.7	2.9	107	33
								2,130	20	11,480	0	26.04	.5	311	0	.7	25	143
																	352,000	1,806
																	655,000	1,474
																	1,007,000	3,274

Net Weight (Rounded Totals)
Scrap - 65% of Steel and 45% of Aluminum Gross
Gross (Ingot)

II AIR FORCES

Pistols	191,428	387,343	15,000	11.9***	0	4	7,657	7,343	5	9,571	2.2	0	0.5	1,937	.44	0	15	0
Rifles (Carbines)	64,050	140,079	12,000	38 ***	0	3	1,921	10,079	5	3,202	2.9	0	10.0	14,008	12.7	0	54	0
SMG	13,770	45,357	15,000	51 ***	0	3	413	13,557	5	689	.31	0	.5	217	.1	0	51	0
LMG	1,709	4,466	1,000	1.19***	0	2	34	966	6	103	1.86	0	20.0	893	1.6	0	5	0
HMG	204	596	100	.36***	0	2	4	96	6	13	.02	0	.5	3	.005	0	0	0
7.62 mm AC MG	9,900	25,102	3,000	3.6 ***	0	2	198	2,802	6	594	1.08	0	20.0	4,620	8.4	0	13	0
12.7 mm AC MG	25,000	53,500	4,000	4.8 ***	0	2	500	3,500	6	1,500	2.7	0	20.0	10,700	19.4	0	27	0
20 mm AC	13,000	31,240	1,500	10.9 ***	0	2	260	1,240	6	780	2.8	0	.5	156	.57	0	14	0
23 mm AC	12,000	31,260	1,500	10.9 ***	0	2	240	1,260	6	720	2.6	0	.5	156	.57	0	14	0
37 mm AC	500	495	100	78	.7	1	5	95	5	25	1.9	.009	.5	3	.19	.015	80	
																	270	1
																	500	2
																	770	3

Net Weight (Rounded Totals)
Scrap - 65% of Steel and 45% of Aluminum Gross
Gross (Ingot)

III MISCELLANEOUS
Estimated to be 30% of the total weight of weapons for Ground and Air Forces

Net Weight (Rounded Totals)	105,000	54
Scrap - 65% of Steel and 45% of Aluminum Gross	195,000	442
Gross (Ingot)	300,000	986

IV AMMUNITION FOR GROUND AND AIR FORCES
Ammunition 300,000 0

Net Weight (Rounded Totals)	300,000	
Scrap - 65% of Steel and 45% of Aluminum Gross	557,000	
Gross (Ingot)	857,000	

GRAND TOTAL

NET WEIGHT	757,270	2,34
SCRAP	1,407,500	1,91
GROSS (INGOT)	2,164,770	4,25

* Data and equipment in hands of Air Force troops have been supplied by A-2. Steel and aluminum requirements for each item, production, and storage inventories are I.D. estimates. While the steel and aluminum requirements for each item are believed to be reasonably accurate, estimates of production and storage inventories are conjectural.

** Considered to include weapons in permanent inland (non-naval) fortifications.

*** Per 1,000 units.

**** Decimals have been eliminated in giving the totals in steel requirements by type of equipment.

Type of Equipment	INVENTORY In hands of troops Items	INVENTORY In storage ** Items	NEW PRODUCTION PER YEAR Items	Steel MT	Aluminum MT	DEPLETION % of Eqmt in hands of troops	DEPLETION Items	YEARLY INCREMENT Items	OVERHAUL OF INVENTORY IN HANDS OF TROOPS % of Inventory	Items	Steel MT	Aluminum MT	OVERHAUL OF INVENTORY IN STORAGE % of Inventory	Items	Steel MT	Aluminum MT	TOTAL REQUIREMENTS Steel MT ****	Aluminum MT ****
Pistols	304,000	338,520	25,000	19.8***	0	4	12,160	12,840	5	15,200	3.4	0	.5	1,693	.38	0	24	0
Rifles (Carbines)	1,676,000	4,296,160	423,000	1,341.0***	0	3	50,280	372,720	5	83,800	76	0	10	429,616	389.7	0	1,807	0
SMG	835,000	1,679,850	85,000	289 ***	0	3	25,050	59,950	5	41,750	18.9	0	.5	8,399	3.8	0	312	0
LMG	141,150	218,531	9,000	10.7***	0	2	2,823	6,177	6	8,469	15.36	0	20	43,706	19.3	0	105	0
HMG	27,740	79,335	7,000	25.4***	0	2	555	6,445	6	1,644	3.01	0	.5	397	.72	0	29	0
AAMG	10,190	57,568	6,000	10	0	2	204	5,796	6	611	2.77	0	.5	868	1.3	0	14	0
82 Mortar	22,105	38,174	1,500	405	0	2	442	1,058	4	884	22	0	.5	191	4.7	0	432	0
120 Mortar	8,695	27,778	1,500	675	0	2	174	1,326	4	348	31.5	0	.5	139	12.6	0	719	0
160 Mortar	1,660	12,801	2,000	1,800	0	2	33	4,967	4	66	12	0	.5	57	10.3	0	1,822	0
37 AA Gun	10,840	19,167	500	1,135	4.5	1	108	392	5	542	110	.5	.5	96	19.55	.087	1,265	5.6
57 AT Gun	6,930	17,293	500	920	4.5	1	69	431	5	347	35.3	.16	.5	87	8.8	.039	564	4.4
76 Mow.	1,120	9,667	600	360	0	1	11	589	5	56	8.89	0	.5	48	7.6	0	376	0
76 Gun	8,080	20,157	800	896	0	1	81	719	5	404	174	0	.5	101	43.4	0	1,113	0
76 HP Gun	720	4,671	Not Prod.	0	0	6	43	None	18	130	176	1.173	.5	23	31.8	.21	208	1.4
76 AA Gun	2,000	7,880	Not Prod.	0	0	2	40	None	8	160	159.6	.36	.5	14	14.36	.03	174	.1
85 AA Gun	3,960	12,920	700	3,178	0	1	60	640	5	298	540	.68	.5	65	117.2	.146	3,835	.8
85 AT Gun	480	4,285	800	1,816	0	1	5	795	5	24	43.5	.05	.5	21	38.8	.048	1,898	.2
100 AT Gun	720	4,379	800	2,536	0	1	7	793	5	36	65.3	.08	.5	22	39.7	.049	2,641	.3
100 HP Gun	1,770	3,642	960	27,840	456	6	106	854	18	319	578	4.33	.5	18	33.02	.247	28,451	484.2
105 AA Gun	1,000	3,470	1,000	14,500	0	1	10	990	5	50	106.5	.11	.5	17	37.1	.039	14,644	.1
122 Gun	420	4,168	200	1,270	0	1	4	196	5	21	50.4	.05	.5	21	50	.047	1,370	.1
122 Mow.	5,700	14,729	200	454	0	1	57	143	5	285	213.3	.646	.5	74	55.08	.167	722	.8
122 HP Gun	650	7,143	420	19,446	21	6	39	381	18	117	318.4	2.1	.5	36	97.2	.647	19,862	23.7
132 RL (M 13)	1,572	3,553	200	726	4.6	1	16	184	5	79	35.6	0	.5	18	8.03	0	770	4.6
152 Mow.	1,200	8,914	50	170	0	1	12	38	5	60	70.4	.14	.5	45	52.3	.109	293	.2
152 Gun-Mow.	1,380	4,708	50	340	0	1	14	36	5	69	166.2	.156	.5	24	56.6	.05	563	.2
152 HP Gun	2,540	2,264	420	19,446	21	6	152	268	18	457	1,244	8.29	.5	11	30.75	.205	20,721	29.4
203 Mow.	72	515	30	516	0	.5	0	30	2.5	2	8.8	.004	.5	3	12.2	.006	537	.0
210 Gun	48	340	30	1,224	0	.5	0	30	2	1	5.7	.02	.5	2	10.18	.038	1,240	.0
280 Mow.	48	230	10	182	0	.25	0	10	2	1	6.5	.02	.5	1	7.8	.2	196	.2
305 Mow.	48	180	10	408	0	.25	0	10	2	1	7.8	.02	.5	1	7.35	.02	423	.0
T-34 Med. Tk	12,635	26,926	3,600	114,480	180	6	758	2,842	18	2,274	4,126	31	.5	135	24.4	1.8	118,630	235.4
JS Hvy Tk	2,010	4,437	600	27,780	30	6	121	479	18	362	984.6	6.56	.5	22	60.4	.40	28,825	36.9
Armored Car	2,735	508	Not Prod.	0	0	6	164	None	10	274	24.8	.62	.5	3	.23	.006	25	.6
Armored Carrier	270	952	Not Prod.	0	0	6	16	None	18	48	4.4	.11	.5	3	.43	.010	5	.1
Trucks	320,600	131,012	30,000	81,600	690	6	19,236	10,764	12	38,472	1,745	87.2	.5	655	29.7	1.48	83,375	778.68
Tractors	12,570	2,536	1,200	9,840	27.6	6	754	446	18	2,263	2,052.62	15.39	.5	13	11.5	.086	11,904	43.0
Motorcycles	29,030	49,774	5,000	2,500	25	6	1,742	3,258	10	2,903	26.3	.66	.5	249	2.25	.056	2,529	25.7
Horsedrawn Vehicles	44,060	11,080	800	72	0	1	440	360	3	1,320	5.9	0	.5	55	.26	0	78	0
Kitchens	25,058	25,747	500	90	25	1	251	249	1	251	11.4	5.68	.5	129	5.8	2.9	107	33.5
Radios	57,400	66,390	5,000	25	115	5	2,870	2,130	20	1,480	0	26.04	.5	332	0	.75	25	141.79
																Net Weight (Rounded Totals)	353,000	1,850
																Scrap-65% of Steel and 45% of Aluminum Gross	653,571	1,513
																Gross (Ingot)	1,006,571	3,363
II AIR FORCES																		
Pistols	191,428	402,089	15,000	11.9***	0	4	7,657	7,343	5	9,571	2.2	0	.5	2,010	.46	0	15	0
Rifles (Carbines)	64,030	160,237	12,000	38 ***	0	3	1,921	10,079	5	3,202	2.9	0	10	16,024	15	0	56	0
SMG	13,770	70,071	15,000	51 ***	0	3	413	13,357	5	689	.31	0	.5	350	.16	0	51	0
LMG	1,709	6,398	1,000	1.1***	0	2	34	966	6	103	1.86	0	20	1,280	2.32	0	5	0
HMG	204	788	100	.36***	0	2	4	96	6	13	.02	0	.5	4	.007	0	0	0
7.62 mm AC MG	9,900	28,706	3,000	3.6***	0	2	198	2,802	6	594	1.08	0	20	5,741	10.42	0	15	0
12.7 mm AC MG	25,000	60,500	4,000	4.6***	0	2	500	3,500	6	1,500	2.7	0	20	12,100	21.95	0	29	0
20 mm AC	13,000	33,720	1,500	10.5***	0	2	260	1,240	6	780	2.8	0	.5	169	.61	0	14	0
23 mm AC	12,000	33,780	1,500	10.5***	0	2	240	1,260	6	720	2.6	0	.5	169	.61	0	14	0
53 mm AC	500	685	100	78	.7	1	5	95	5	25	1.9	.009	.5	3	.26	.001	80	.7
																Net Weight (Rounded Totals)	280	1
																Scrap-65% of Steel and 45% of Aluminum Gross	520	2
																Gross (Ingot)	800	3
III MISCELLANEOUS																		
Estimated to be 30 percent of the total weight of weapons for Ground and Air Forces																Net Weight (Rounded Totals)	105,984	555
																Scrap-65% of Steel and 45% of Aluminum Gross	196,827	454
																Gross (Ingot)	302,811	1,009
IV AMMUNITION FOR GROUND AND AIR FORCES																		
Ammunition			300,000	0												Net Weight (Rounded Totals)	300,000	0
																Scrap-65% of Steel and 45% of Aluminum Gross	557,000	0
																Gross (Ingot)	857,000	0
																GRAND TOTAL: NET WEIGHT	759,264	2,406
																SCRAP	1,409,918	1,969
																GROSS (INGOT)	2,169,182	4,375

* Data and equipment in hands of Air Force troops have been supplied by A-2. Steel and aluminum requirements for each item, production, and storage inventories are I.D. estimates. While the steel and aluminum requirements for each item are believed to be reasonably accurate, estimates of production and storage inventories are conjectural.

** Considered to include weapons in permanent inland (non-naval) fortifications.

*** Per 1,000 units.

**** Decimals have been eliminated in giving the totals in steel requirements by type of equipment.

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TOP SECRET

CHART III

ESTIMATED POL AND DIESEL FUEL CONSUMPTION
OF
SOVIET ARMED FORCES (EXCLUDING NAVY)*
IN METRIC TONS

1949

CATEGORY	ARMY	AIR FORCE	MVD	PVO	TOTAL CONSUMPTION REQUIREMENTS
Motor Fuel	902,600	182,000	114,000	59,400	
Lubes	90,300	18,000	11,400	5,900	
Miscellaneous Uses	45,100	6,000	5,700	2,800	
Total	1,038,000	206,000	131,100	68,100	1,443,200
Diesel Fuel	167,500	33,000			
Lubes))- Miscellaneous Uses)	18,500	3,000			
Total	186,000	36,000			222,000

1950

CATEGORY	ARMY	AIR FORCE	MVD	PVO*	TOTAL CONSUMPTION REQUIREMENTS
Motor Fuel	919,800	182,000	114,000	59,400	
Lubes	92,000	18,000	11,400	5,900	
Miscellaneous Uses	46,000	6,000	5,700	2,800	
Total	1,057,800	206,000	131,100	68,100	1,463,000
Diesel Fuel	176,000	33,000			
Lubes))- Miscellaneous Uses)	22,000	3,000			
Total	198,000	36,000			234,000

1951

CATEGORY	ARMY	AIR FORCE	MVD	PVO	TOTAL CONSUMPTION REQUIREMENTS
Motor Fuel	945,700	182,000	114,000	59,400	
Lubes	94,500	18,000	11,400	5,900	
Miscellaneous Uses	47,300	6,000	5,700	2,800	
Total	1,087,500	206,000	131,100	68,100	1,492,700
Diesel Fuel	182,500	33,000			
Lubes))- Miscellaneous Uses)	24,500	3,000			
Total	207,000	36,000			243,000

1952

CATEGORY	ARMY	AIR FORCE	MVD	PVO	TOTAL CONSUMPTION REQUIREMENTS
Motor Fuel	962,800	182,000	114,000	59,400	
Lubes	96,300	18,000	11,400	5,900	
Miscellaneous Uses	48,100	6,000	5,700	2,800	
Total	1,107,200	206,000	131,100	68,100	1,512,400
Diesel Fuel	197,000	33,000			
Lubes))- Miscellaneous Uses)	20,000	3,000			
Total	217,000	36,000			253,000

U.S.S.R. STEEL AND ALUMINUM REQUIREMENTS FOR GROUND AND AIRFORCE WEAPONS AND AMMUNITION*

I GROUND FORCES (INCLUDING MVT AND PVO)

1 January 1951

Type of Equipment	INVENTORY In hands of troops Items	INVENTORY In storage** Items	NEW PRODUCTION PER YEAR Items	Steel MT	Aluminum MT	DEPLETION % of Eqpt in hands of troops	DEPLETION Items	YEARLY INCREMENT Items	OVERHAUL OF INVENTORY IN HANDS OF TROOPS % of Inventory	Items	Steel MT	Aluminum MT	OVERHAUL OF INVENTORY IN STORAGE % of Inventory	Items	Steel MT	Aluminum MT	TOTAL REQUIREMENTS Steel**** MT	Aluminum MT
Pistols	304,000	385,680	25,000	19.8***	0	4	12,160	12,840	5	15,200	3.4	0	.5	1,928	.36	0	24	
Rifles (Carbines)	1,676,000	3,983,440	423,000	1,341.0***	0	3	50,280	372,720	5	83,800	76	0	10	392,344	353.9	0	1,773	
SMG	835,000	1,619,900	85,000	269 ***	0	3	25,050	59,950	5	41,750	18.9	0	.5	8,100	3.67	0	312	
LMG	141,150	218,354	9,000	10.7***	0	2	2,823	6,177	6	8,469	15.36	0	20	42,471	77.05	0	103	
AAMG	27,740	72,890	7,000	25.4***	0	2	555	6,445	6	1,644	3.01	0	.5	364	.66	0	29	
82 Mortar	10,190	51,592	6,000	10.0***	0	2	204	5,976	6	611	2.77	0	.5	258	1.17	0	14	
120 Mortar	22,105	37,116	1,500	405	0	2	442	1,058	4	884	22.	0	.5	186	4.64	0	432	
160 Mortar	8,695	26,452	1,500	675	0	2	174	1,326	4	348	31.5	0	.5	132	11.97	0	719	
37 AA Gun	1,660	10,334	2,000	1,800	0	2	33	1,967	4	66	12	0	.5	52	9.43	0	1,821	
57 AT Gun	10,840	18,784	500	1,135	4.5	1	108	392	5	542	110	.5	.5	94	19.18	.09	1,264	1.09
76 Howitzer	6,930	16,862	500	520	4.5	1	69	431	5	347	35.3	.16	.5	84	8.57	.04	564	.49
76 Gun	1,120	9,098	600	360	0	1	11	589	5	56	8.89	0	.5	45	7.14	0	376	
76 SP Gun	8,080	19,438	800	896	0	1	81	719	5	404	174	0	.5	97	41.8	0	1,112	
76 AA Gun	720	4,714	Not Prod.	0	0	6	43	None	18	130	176	1.175	.5	24	32.65	.22	209	1.89
85 AA Gun	2,000	2,920	Not Prod.	0	0	2	40	None	8	160	159.6	.36	.5	15	14.56	.03	174	.39
85 AT Gun	5,960	12,280	700	3,178	0	1	60	640	5	298	540	.68	.5	61	110.6	.14	3,829	.89
100 AT Gun	480	3,490	800	1,816	0	1	5	795	5	24	43.5	.05	.5	17	30.84	.04	1,890	.49
100 Gun	720	3,586	800	2,536	0	1	7	793	5	36	65.3	.08	.5	18	32.6	.04	2,633	.62
105 How.	1,770	2,788	960	27,840	480	6	106	854	18	319	578	4.33	.5	14	25.4	.3	28,443	4.63
122 Gun	1,000	2,480	1,000	14,500	0	1	10	990	5	50	106.5	.11	.5	12	25.6	.03	14,632	3.63
122 How.	420	3,972	200	1,270	0	1	4	196	5	21	50.4	.05	.5	20	28.08	.05	1,348	
122 SP Gun	5,700	14,586	200	454	0	1	57	143	5	285	213.3	.646	.5	73	54.6	.17	722	.18
132 Rkt Gun (M 13)	650	6,762	420	19,446	21	6	39	381	18	117	318.4	2.1	.5	3	8.2	.05	19,773	5
152 Gun	1,572	3,368	200	726	4.6	1	16	184	5	79	35.6	0	.5	17	7.7	0	769	
152 SP How.	1,200	8,876	50	170	0	1	12	38	5	60	70.4	.14	.5	44	51.7	.1	292	
152 SP Gun	1,380	4,672	50	340	0	1	14	36	5	69	166.2	.156	.5	23	55.4	.05	562	.11
203 How.	2,540	1,996	420	19,446	21	6	152	268	18	457	1,244	8.29	.5	10	27.2	.18	20,717	37.17
210 Gun	72	485	30	516	0	.5	0	30	2.5	2	8.8	.004	.5	2	9.75	.005	535	.961
280 How.	48	310	30	1,224	0	.5	0	30	2.0	1	5.7	.02	.5	2	11.9	.05	1,242	2.47
305 How.	48	220	10	182	0	.25	0	10	2	1	6.5	.02	.5	1	6.8	.02	195	
305 Gun	48	170	10	408	0	.25	0	10	2	1	7.8	.02	.5	1	8.16	.02	424	
T-34 Med. Tk	12,635	24,084	3,600	114,480	180	6.0	758	2,842	18	2,274	4,126	31.	.5	120	217.7	16.3	118,824	227.7
JS Hvy Tk	2,010	3,958	600	27,780	30	6.0	121	479	18	362	984.6	6.56	.5	20	54.4	.36	28,819	36.8
Armored Car	2,735	672	Not Prod.	0	0	6.0	164	None	10	274	24.8	.62	.5	34	3.08	.08	28	
Armored Carrier	270	968	Not Prod.	0	0	6.0	16	None	18	48	4.4	.11	.5	5	.45	.01	5	
Truck	300,600	139,048	30,000	81,600	690	6.0	18,036	11,964	12	36,072	1,636.2	81.8	.5	695	31.5	1.57	83,268	77.4
Tractor	12,570	2,992	1,200	9,840	27.6	6.0	754	446	18	2,263	2,052.62	15.39	.5	11	9.98	.10	11,903	43.09
Motorcycles	29,030	46,516	5,000	2,500	25	6.0	1,742	3,258	10	2,903	26.3	.66	.5	233	2.1	.07	2,528	25.73
Horse-drawn Vehicles	44,060	10,720	800	72	0	1.0	440	360	3	1,320	5.9	0	.5	54	.24	0	78	
Kitchens	25,058	25,498	500	90	25	1.0	251	249	1	251	11.4	5.68	.5	127	5.76	2.88	107	33.96
Radios	57,400	64,260	5,000	25	115	5.0	2,870	2,130	20	11,480	0	26.04	.5	321	0	7.28	25	148.4
																Net Weight (Rounded Totals)	353,000	1,643
																Scrap-65% of Steel and 45% of Aluminum Gross	655,571	1,509
																Gross (Ingot)	1,008,571	3,152

II AIR FORCES

Pistols	191,428	394,686	15,000	11.9***	0	4	7,657	7,343	5	9,571	2.2	0	0.5	1,973	.45	0	15	
Rifles (Carbines)	64,030	150,158	12,000	38 ***	0	3	1,921	10,079	5	3,202	2.9	0	10	15,016	13.6	0	55	
SMG	13,770	56,714	15,000	51 ***	0	3	413	13,357	5	689	.31	0	.5	284	.13	0	51	
LMG	1,709	5,432	1,000	1.19***	0	2	34	966	6	103	1.86	0	20	1,086	1.97	0	5	
HMG	204	692	100	.36***	0	2	4	96	6	12	.02	0	.5	4	.006	0	0	
7.62 AAC MG	9,900	25,904	3,000	3.6***	0	2	198	2,802	6	594	1.08	0	20	5,181	9.39	0	14	
12.7 AAC MG	25,000	57,000	4,000	4.8***	0	2	500	3,500	6	1,500	2.7	0	20	11,400	20.68	0	28	
20	13,000	32,480	1,500	10.9***	0	2	260	1,240	6	780	2.8	0	.5	162	.59	0	14	
23	12,000	32,520	1,500	10.9***	0	2	240	1,260	6	720	2.6	0	.5	163	.59	0	14	
53	500	590	100	78	.7	1	5	95	5	25	1.9	.009	.5	3	.23	.001	80	
																Net Weight (Rounded Totals)	276	
																Scrap-65% of Steel and 45% of Aluminum Gross	512	
																Gross (Ingot)	788	3

III MISCELLANEOUS

Estimated to be 30 percent of the total weight of weapons for Ground and Air Forces

																Net Weight (Rounded Totals)	105,900	529
																Scrap-65% of Steel and 45% of Aluminum Gross	196,671	474
																Gross (Ingot)	302,571	1,003

IV AMMUNITION FOR GROUND AND AIR FORCES

Ammunition			300,000	0												Net Weight (Rounded Totals)	300,000	0
																Scrap-65% of Steel and 45% of Aluminum Gross	557,000	0
																Gross (Ingot)	857,000	0

GRAND TOTAL	NET WEIGHT	759,176	2,399
	SCRAP	1,409,754	1,963
	GROSS (INGOT)	2,168,930	4,362

* Data and equipment in hands of Air Force troops have been supplied by A-2. Steel and aluminum requirements for each item, production, and storage inventories are I.D. estimates. While the steel and aluminum requirements for each item are believed to be reasonably accurate, estimates of production and storage inventories are conjectural.

** Considered to include weapons in permanent inland (non-naval) fortifications.

*** Per 1,000 units.

**** Decimals have been eliminated in giving the totals in steel requirements by type of equipment

B. SOVIET AIR FORCES, 1949 - 1952 REQUIREMENTS FOR STEEL AND ALUMINUM, PETROLEUM, AND TECHNICAL MANPOWER

1. The Problem

The problem is to derive estimates of the quantities of raw steel, raw aluminum, petroleum supplies, and technical manpower required by the Soviet Air Forces for their operation and maintenance during the period June 1949 - June 1952. The following items of information are specifically requested:

a. The 1949 inventory of all Soviet Air Forces equipment and supply estimated to be on hand and in reserve, by item, and by tons of steel and aluminum represented.

b. The estimated annual production by item by tons of steel and aluminum required.

c. The estimated annual replacement rate for each item.

d. The expected inventory held by the Soviet Air Forces in 1952, by item, by tons of steel and aluminum represented.

e. Current annual requirements of the Soviet Air Forces and Civil Air Fleet for petroleum, oil, and lubricants, for aircraft only.

f. The technical manpower necessary to staff estimated Air Forces technical organizations.

2. Hypothesis

It is postulated that, during the June 1949 - June 1952 period, the Soviet Union will not be engaged in active preparations for war, but will rather maintain its Air Forces at a strength deemed necessary to continue progress in the accomplishment of their aims without resort to war; that is, a continuation of the methods of the so-called "cold war."

3. Discussion

a. Nature of Data. It is of prime importance to make quite clear that all data contained in this report are estimates. Due to the well-known limitations of intelligence information, these estimates contain a greater or lesser margin of error. It should be noted, furthermore, that the estimates presented here will change as new information becomes available and as further opportunity is afforded to study the problem under consideration.

b. Methodology. A complete explanation of the methodology employed in the preparation of this report and a presentation of the many calculations made in arriving at the estimates are too lengthy to be set forth here. However, the steps taken in deriving steel and aluminum requirements are outlined briefly, as follows:

(1) Since inventories of all items of equipment on hand and in reserve for the 1949-52 period were given, as well as annual replacement rates for each item, it was only necessary to apply these rates to inventories (with due regard for predicted change in inventory) to obtain estimates of annual production.

(2) It was determined from U. S. industry what quantities of steel and aluminum are required to produce an item of a given description. In the case of aircraft, for example, it was found that the weighted average amount of aluminum embodied in a complete aircraft is approximately 0.62 pounds per pound of airframe weight and that the weighted average gross rough weight of aluminum required by an assembly plant per pound of airframe weight produced is approximately 1.33 pounds. The figures for steel are 1.23 pounds and 2.02 pounds, respectively. According to Air Material Command, currently produced Soviet aircraft have a materials composition similar to that of U. S. aircraft. It is, therefore, a valid procedure to apply U. S. weight ratios to the Soviet aircraft industry.

(3) In the process of converting raw ingot metal into items of military equipment, there are three points at which the weights of the metal may be measured. This follows from the nature of the processes involved. Steel and aluminum are produced at the open hearth (or Bessemer) plant and at the aluminum plant in the form of ingots. These ingots are then milled to produce sheets and shapes, wire, rod, tubing, etc., and in the course of this operation a certain amount of metal is lost as scrap; a large part of this scrap, however, is recoverable. The finished sheets, shapes, etc., are sent to the plants manufacturing aircraft, armaments, etc., and in the fabrication process a further scrap loss is experienced so that the net weight of metal embodied in the finished product is considerably less than the gross rough weight of sheet and shapes initially received by the factory. The three relevant weights involved are thus:

(a) Weight of ingot metal.
(b) Weight of the metal in the form of sheet, shapes, etc. This is known as the gross rough weight.
(c) Weight of metal actually embodied in the finished product. This is known as the net finished weight.

In this study the appropriate weight ratios were applied in order to derive all three measures for estimates of the quantities of metals required for annual production and maintenance of Soviet Air Forces equipment. The 1949 and 1952 inventories, however, are measured only in terms of net finished weights, for obvious reasons.

c. The Estimates. The desired estimates are set forth in the order required in the statement of the problem. Nearly all figures in this report were derived in part by the use of ratios and percentages and are carried out to the last whole integer for the sake of arithmetical consistency in the tabulations. This apparent precision is NOT an indication of the accuracy of the estimates, any of which may be "rounded off" to suit the purpose of the reader.

d. The Inventory. The inventory by item has not been reduced to minor items of supply. The weight computations for aircraft are based upon U. S. planning factors. Currently produced Soviet aircraft have a materials composition similar to that of U. S. aircraft. The U.S. weight planning factors include the number of engines, spare parts, etc., expected to be required by the aircraft during its normal lifetime.

(1) 1949 Inventory. A detailed statement of inventory of Soviet Air Forces equipment in June 1949, by item, by tons of steel and aluminum represented is presented in Annex I. The following tabulation provides the data in condensed form:

SOVIET AIR FORCES - EQUIPMENT INVENTORY, JUNE 1949

NET WEIGHT OF STEEL AND ALUMINUM EMBODIED IN EQUIPMENT 1/

ITEM	NUMBER ON HAND AND IN RESERVE	NET WEIGHT OF MATERIALS EMBODIED IN EQUIPMENT (All weights in Metric Tons)	
		STEEL	ALUMINUM
Aircraft	37,000	89,971	45,351
Armaments	1,006,241	2,668	7
Trucks & Tractors	48,252	159,300	1,110
Total Tons of Materials		251,939	46,468

(2) Estimated Annual Production, by Item, by Tons of Steel and Aluminum Represented. Detailed estimates for this item are presented in Annex II. The following tabulation provides the data in condensed form:

1/ This is an estimate of the weight of materials embodies in equipment already produced. The annual requirements appear on Page X-10.

SOVIET AIR FORCES - ESTIMATED ANNUAL OUTPUT OF EQUIPMENT 1949 - 1952 AND ESTIMATED STEEL AND ALUMINUM REQUIREMENTS FOR PRODUCTION AND MAINTENANCE OF EQUIPMENT

YEAR & ITEM	ANNUAL OUTPUT	METRIC TONS OF MATERIALS REQUIRED FOR PRODUCTION AND MAINTENANCE					
		STEEL			ALUMINUM		
		INGOT	GROSS	NET	INGOT	GROSS	NET
June 49 - June 50 1/							
Aircraft (a)	6,226	(b)	32,256	19,641	(c)	21,238	9,900
Arms	53,200	(b)	( )	268	(c)	( )	1
			(28,604)			(253)	
Trucks & Tractors	4,400	(b)	( )	15,134	(c)	( )	118
Total Materials		93,630	60,860	35,043	25,585	21,491	10,019
June 50 - June 51							
Aircraft	6,004	(b)	32,778	19,959	(c)	21,582	10,061
Arms	53,200	(b)	( )	268	(c)	( )	1
			(28,604)			(253)	
Trucks & Tractors	4,400	(b)	( )	15,134	(c)	( )	118
Total Materials		94,434	61,382	35,361	25,994	21,835	10,180
June 51 - June 52							
Aircraft	5,878	(b)	34,829	21,208	(c)	22,932	10,690
Arms	53,200	(b)	( )	268	(c)	( )	1
			(28,604)			(253)	
Trucks & Tractors	4,400	(b)	( )	15,134	(c)	( )	118
		97,589	63,433	33,610	27,601	23,185	10,809

(a) Denotes military cognizance aircraft only.
(b) Ingot weight of steel cannot at this time be broken down precisely by item. A rough approximation may be secured by multiplying net weight by 2.66.
(c) Ingot weight of aluminum cannot at this time be broken down by item. A rough approximation may be obtained by multiplying net weight by 2.55.

1/ Based on the above table, the total requirements of ingot steel for the calendar years 1949-1952 are: 93,186; 94,017; 96,011; 99,215 tons respectively, and of aluminum: 25,381; 25,792; 26,800; 28,451 tons.

(3) Estimated Annual Replacement Rates. Estimated annual replacement rates for each item of Soviet Air Forces equipment are as follows:

ITEM	ESTIMATED ANNUAL REPLACEMENT RATE (%)
AIRCRAFT	
Fighters	39
Attack	35
Light Bombers	26
Medium Bombers	16
Transports	10
Miscellaneous	15
Stored Aircraft	0
AIRCRAFT ARMAMENT	
7.62 mm Guns	2
12.7	2
20.0	2
23.0	2
53.0	1
GROUND WEAPONS	
Pistols	4
Rifles	3
Sub-machine Guns	3
Light Machine Guns	2
Heavy Machine Guns	2
TRUCKS AND TRACTORS	
Trucks	6
Tractors	6

(4) Expected Soviet Air Forces Inventory 1952. Detailed estimates of Soviet Air Forces inventory as of June 1952, by item, and by tons of steel and aluminum represented as shown in Annex III. The following tabulation presents the data in condensed form:

SOVIET AIR FORCES -- EQUIPMENT INVENTORY, JUNE 1952

NET WEIGHT OF STEEL AND ALUMINUM EMBODIED IN EQUIPMENT

ITEM	NO. ON HAND & IN RESERVE	NET WEIGHT OF MATERIALS EMBODIED IN EQUIPMENT	
		STEEL	ALUMINUM
Aircraft	37,000	108,365	54,623
Arms	1,132,145	3,235	9
Trucks & Tractors	52,486	172,853	1,207
Total Tons of Materials		284,453	55,839

(5) Current Annual Petroleum Requirements. Estimates of current annual petroleum requirements of the Soviet Air Forces and Civil Air Fleet are shown in the table below:

ESTIMATED CURRENT ANNUAL PETROLEUM REQUIREMENTS,

IN METRIC TONS

ITEM	REQUIREMENTS		
	Soviet Air Forces	Civil Air Fleet	Total
Aviation Gasoline			
70 octane	10,000	—	10,000
87	10,000	200,000	210,000
91	105,000	—	105,000
95	65,000	—	65,000
100	22,000	—	22,000
Total	212,000	200,000	412,000
Aviation Kerosene	80,000	—	80,000
Lubricants	8,000	5,000	13,000
TOTAL	300,000	205,000	505,000

(6) Technical Manpower. Requirements of the Soviet Air Forces for technical manpower are estimated as follows:

Air Force	Manpower Required
Military Air Force	2,900
Long Range Air Force	500
Fighter Defense Force	650
Naval Air Force	950
TOTAL	5,000

e. The Soviet Naval Air Force Requirements. The Soviet Naval Air Force is a component of the Soviet Air Forces and its requirements for steel, aluminum, and petroleum supplies are included in the Soviet Air Forces totals. The estimated requirements for the Soviet Naval Air Force are fourteen (14) percent of the steel and aluminum and eighteen (18) percent of the petroleum supplies requirements of the Soviet Air Forces.

f. The Problem of Scrap Metal. It should be noted that the ingot weight of steel and aluminum required for the Soviet Air Forces does not represent a net drain on the Soviet economy. This is true because not all of the scrap metal, which is equivalent to the difference between ingot weight initially required and net finished weight finally embodied in the completed product, represents a loss. It is probable that the Soviets recover from 60 per cent to 80 per cent of the scrap metal. The scrap steel, of course, can be used in converters and open hearths in the production of new ingot steel. The scrap aluminum, however, can be used only in the production of secondary aluminum which is inferior to primary aluminum in many uses and cannot be substituted for it in certain other uses. Some secondary metal, however, can be used to make, say, pots and pans, thus releasing primary metal which might otherwise have been consumed for this purpose. A further factor to be considered is that as aircraft and other items of equipment are discarded, they are then sources of scrap metal. The problem raised here should be made the subject of careful study in the future in order to arrive at an estimate of the net drain on the economy of the U.S.S.R. entailed by the support of its Air Forces.

4. Conclusions

Conclusions are presented numerically in brief summary form. All figures are estimates.

a. Steel and Aluminum Requirements

SOVIET AIR FORCES, 1949-52

QUANTITIES OF STEEL AND ALUMINUM EMBODIED IN EQUIPMENT INVENTORY JUNE 1949 AND JUNE 1952, AND REQUIRED FOR ANNUAL PRODUCTION AND MAINTENANCE (a)
(All Figures in Metric Tons)

ITEM	STEEL			ALUMINUM		
	INGOT	GROSS	NET	INGOT	GROSS	NET
Embodied in Inventory, June 1949	(b)	(b)	251,939	(b)	(b)	46,468
Required for Production & Maintenance, June 49 - June 50	93,630	60,860	35,043	25,585	21,491	10,019
Do. June 50 - June 51	94,434	61,382	35,361	25,994	21,835	10,180
Do. June 51 - June 52	97,589	63,433	36,610	27,601	23,185	10,809
Embodied in Inventory June 1952	(b)	(b)	284,453	(b)	(b)	55,839

(a) Includes all equipment (aircraft, armament, vehicles, on hand and in reserve).
(b) Does not apply.

b. Annual Petroleum Requirements

	Metric Tons
Soviet Air Forces	300,000
Civil Air Fleet	205,000
Total	505,000

c. Technical Personnel. Five thousand are required.

ANNEX I

SOVIET AIR FORCES - JUNE 1949

ESTIMATED QUANTITIES OF EQUIPMENT IN OPERATIONAL UNITS AND IN STORED RESERVE AND ESTIMATED AMOUNTS OF STEEL AND ALUMINUM EMBODIED IN THIS EQUIPMENT

TYPE OF EQUIPMENT	NUMBER OF UNITS			METRIC TONS OF STEEL AND ALUMINUM EMBODIED IN EQUIPMENT					
				IN OPERATIONAL USE		IN STORED RESERVE		TOTAL UNITS	
	IN OPERATIONAL USE	IN STORED RESERVE	TOTAL	STEEL	ALUMINUM	STEEL	ALUMINUM	STEEL	ALUMINUM
AIRCRAFT									
FIGHTERS	7,500	10,000	17,500	13,009	6,557	14,238	7,177	27,247	13,734
Jet	1,500	500	2,000	2,968	1,496	990	499	3,958	1,995
Conventional	6,000	9,500	15,500	10,041	5,061	13,248	6,678	23,289	11,739
BOMBERS	7,700	8,000	15,700	28,753	14,494	26,887	13,553	55,640	28,047
Medium	150	0	150	4,058	2,046	0	0	4,058	2,046
Light	4,250	5,000	9,250	16,595	8,365	19,524	9,841	36,119	18,206
Attack	3,300	3,000	6,300	8,100	4,083	7,363	3,712	15,463	7,795
TRANSPORTS	700	0	700	4,490	2,263	0	0	4,490	2,263
MISCELLANEOUS	1,100	2,000	3,100	920	464	1,674	843	2,594	1,307
TOTAL	17,000	20,000	37,000	47,172	23,778	42,799	21,573	89,971	45,351
ARMAMENT									
Aircraft Armament	60,400	130,700	191,100	613	4	831	3	1,444	7
7.62 mm Guns	9,900	20,300	30,200	12	0	24	0	36	0
12.7 mm Guns	25,000	50,000	75,000	30	0	59	0	89	0
20.0 mm Guns	13,000	30,000	43,000	94	0	218	0	312	0
23.0 mm Guns	12,000	30,000	42,000	87	0	218	0	305	0
53.0 mm Guns	500	400	900	390	4	312	3	702	7
Ground Weapons	271,141	544,000	815,141	404	0	820	0	1,224	0
Pistols	191,428	380,000	571,428	151	0	300	0	451	0
Rifles	64,030	130,000	194,030	203	0	412	0	615	0
Sub-machine Guns	13,770	30,000	43,770	47	0	102	0	149	0
Light Machine Guns	1,709	3,500	5,209	2	0	4	0	6	0
Heavy Machine Guns	204	500	704	1	0	2	0	3	0
TOTAL	331,541	674,700	1,006,241	1,017	4	1,651	3	2,668	7
TRUCKS AND TRACTORS									
Trucks	39,632	3,500	43,132	107,800	912	9,500	80	117,300	992
Tractors	4,620	500	5,120	37,900	106	4,100	12	42,000	118
TOTAL	44,252	4,000	48,252	145,700	1,018	13,600	92	159,300	1,110
TOTAL TONS OF MATERIALS				193,889	24,800	58,050	21,668	251,939	46,468

TOP SECRET

ANNEX II

SOVIET AIR FORCES - ESTIMATED PRODUCTION OF EQUIPMENT, JUNE 1949 - JUNE 1952
AND ESTIMATED STEEL AND ALUMINUM REQUIREMENTS FOR ESTIMATED PRODUCTION AND
FOR MAINTENANCE OF EQUIPMENT
(ALL WEIGHTS ARE IN METRIC TONS)

	JUNE 1949 - JUNE 1950					JUNE 1950 - JUNE 1951					JUNE 1951 - JUNE 1952				
		STEEL REQUIRED FOR NEW OUTPUT AND OVERHAUL (METRIC TONS)		ALUMINUM REQUIRED FOR NEW OUTPUT AND OVERHAUL (METRIC TONS)			STEEL REQUIRED FOR NEW OUTPUT AND OVERHAUL (METRIC TONS)		ALUMINUM REQUIRED FOR NEW OUTPUT AND OVERHAUL (METRIC TONS)			STEEL REQUIRED FOR NEW OUTPUT AND OVERHAUL (METRIC TONS)		ALUMINUM REQUIRED FOR NEW OUTPUT AND OVERHAUL (METRIC TONS)	
TYPE OF EQUIPMENT	NO. OF UNITS PRODUCED	GROSS (a)	NET (b)	GROSS (a)	NET (b)	NO. OF UNITS PRODUCED	GROSS (a)	NET (b)	GROSS (a)	NET (b)	NO. OF UNITS PRODUCED	GROSS(a)	NET (b)	GROSS (a)	NET (b)
AIRCRAFT															
FIGHTERS	3,381	10,189	6,204	6,709	3,127	3,203	10,582	6,444	6,968	3,249	3,095	11,566	7,043	7,615	3,550
Jet	1,780	5,789	3,525	3,812	1,777	2,170	7,554	4,600	4,974	2,319	2,560	9,850	5,998	6,485	3,023
Conventional	1,601	4,400	2,679	2,897	1,350	1,033	3,028	1,844	1,994	930	535	1,716	1,045	1,130	527
BOMBERS	2,594	21,044	12,814	13,856	6,459	2,550	21,173	12,892	13,941	6,498	2,532	22,071	13,439	14,532	6,774
Medium	154	6,842	4,166	4,505	2,100	167	7,420	4,518	4,886	2,277	185	8,220	5,005	5,412	2,523
Light	1,135	8,942	5,445	5,888	2,745	1,078	8,493	5,171	5,592	2,607	1,042	8,591	5,231	5,657	2,637
Attack	1,305	5,260	3,203	3,463	1,614	1,305	5,260	3,203	3,463	1,614	1,305	5,260	3,203	3,463	1,614
TRANSPORTS	74	780	475	513	239	74	780	475	513	239	74	949	578	625	291
MISCELLANEOUS	177	243	148	160	75	177	243	148	160	75	177	243	148	160	75
TOTAL	6,226	32,256	19,641	21,238	9,900	6,004	32,778	19,959	21,582	10,061	5,878	34,829	21,208	22,932	10,690
ARMAMENT															
Aircraft Armament	10,100	(a)	146	(a)	1	10,100	(a)	146	(a)	1	10,100	(a)	146	(a)	1
7.62 mm Guns	3,000		12		0	3,000		12		0	3,000		12		0
12.7 mm Guns	4,000		26		0	4,000		26		0	4,000		26		0
20.0 mm Guns	1,500		14		0	1,500		14		0	1,500		14		0
23.0 mm Guns	1,500		14		0	1,500		14		0	1,500		14		0
[illegible].0 mm Guns	100		80		1	100		80		1	100		80		1
Ground Weapons	43,100	(a)	122	(a)	0	43,100	(a)	122	(a)	0	43,100	(a)	122	(a)	0
Pistols	15,000		14		0	15,000		14		0	15,000		14		0
Rifles	12,000		53		0	12,000		53		0	12,000		53		0
Sub-machine Guns	15,000		51		0	15,000		51		0	15,000		51		0
Light Machine Guns	1,000		4		0	1,000		4		0	1,000		4		0
Heavy Machine Guns	100		*		0	100		*		0	100		*		0
TOTAL	53,200	(a)	268	(a)	1	53,200	(a)	268	(a)	1	53,200	(a)	268	(a)	1
TRUCKS AND TRACTORS															
Trucks	4,000		11,097		103	4,000		11,097		103	4,000		11,097		103
Tractors	400		4,037		15	400		4,037		15	400		4,037		15
TOTAL	4,400	(a)	15,134	(a)	118	4,400	(a)	15,134	(a)	118	4,400	(a)	15,134	(a)	118
Tons of Materials for Armaments, Trucks and Tractors		28,604	15,402	253	119		28,604	15,402	253	119		28,604	15,402	253	119

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ANNEX III

SOVIET AIR FORCES - JUNE 1952

ESTIMATED QUANTITIES OF EQUIPMENT IN OPERATIONAL UNITS AND IN STORED RESERVE AND ESTIMATED AMOUNTS OF STEEL AND ALUMINUM EMBODIED IN THIS EQUIPMENT

TYPE OF EQUIPMENT	NUMBER OF UNITS			METRIC TONS OF STEEL AND ALUMINUM EMBODIED IN EQUIPMENT					
				IN OPERATIONAL USE		IN STORED RESERVE		TOTAL UNITS	
	IN OPERATIONAL USE	IN STORED RESERVE	TOTAL	STEEL	ALUMINUM	STEEL	ALUMINUM	STEEL	ALUMINUM
AIRCRAFT									
FIGHTERS	7,500	10,000	17,500	15,396	7,760	16,032	8,081	31,428	15,841
Jet	4,500	*	*	10,041	5,061	*	*	*	*
Conventional	3,000	*	*	5,355	2,699	*	*	*	*
BOMBERS	7,700	8,000	15,700	40,336	20,332	29,321	14,781	69,657	35,113
Medium	500	0	500	13,527	6,818	0	0	13,527	6,818
Light	3,900	5,000	8,900	18,709	9,431	21,958	11,069	40,667	20,500
Attack	3,300	3,000	6,300	8,100	4,083	7,363	3,712	15,463	7,795
TRANSPORTS	700	0	700	4,686	2,362	0	0	4,686	2,362
MISCELLANEOUS	1,100	2,000	3,100	920	464	1,674	843	2,594	1,307
TOTAL	17,000	20,000	37,000	61,338	30,918	47,027	23,705	108,365	54,623
ARMAMENT									
Aircraft Armament	60,400	157,391	217,791	613	4	1,130	5	1,743	9
7.62 mm Guns	9,900	28,706	38,606	12	0	34	0	46	0
12.7 mm Guns	25,000	60,500	85,500	30	0	72	0	102	0
20.0 mm Guns	13,000	33,720	46,720	94	0	245	0	339	0
23.0 mm Guns	12,000	33,780	45,780	87	0	245	0	332	0
37.0 mm Guns	500	685	1,185	390	4	534	5	924	9
Ground Weapons	271,141	643,213	914,354	404	0	1,088	0	1,492	0
Pistols	191,428	402,029	593,457	151	0	318	0	469	0
Rifles	64,030	160,237	224,267	203	0	507	0	710	0
Sub-machine Guns	13,770	73,761	87,531	47	0	252	0	299	0
Light Machine Guns	1,709	6,398	8,107	2	0	8	0	10	0
Heavy Machine Guns	204	788	992	1	0	3	0	4	0
TOTAL	331,541	800,604	1,132,145	1,017	4	2,218	5	3,235	9
TRUCKS AND TRACTORS									
Trucks	39,632	7,366	46,998	107,800	912	20,035	169	127,835	1,081
Tractors	4,620	868	5,488	37,900	106	7,118	20	45,018	126
TOTAL	44,252	8,234	52,486	145,700	1,018	27,153	189	172,853	1,207
TOTAL TONS OF MATERIALS				208,055	31,940	76,398	23,899	284,453	55,839

*Cannot be broken down between jet and conventional aircraft.

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TABLE I

USSR NAVY - STEEL, ALUMINUM AND MAN-HOUR REQUIREMENTS FOR PRINCIPAL COMBATANT VESSELS 1/

IDENTITY			METALS REQUIREMENTS						MAN-HOURS REQUIREMENTS (1,000 Hrs.)					
			PER SHIP			PER CLASS			PER SHIP			PER CLASS		
TYPE	CLASS	NO. IN CLASS	CARBON STEEL	ALLOY STEEL	ALUMINUM	CARBON STEEL	ALLOY STEEL	ALUMINUM	SKILLED	UNSKILLED	TOTAL	SKILLED	UNSKILLED	TOTAL
	VESSELS AVAILABLE 1949													
OBB	SAVOUR	1				12,549	16,923	188				9,000	3,500	12,500
OBB	SVANGUT	2	12,549	16,923	188	25,098	33,846	376	9,000	3,500	12,500	18,000	7,000	25,000
BM	ILMARINEN	1				2,600	2,450	130				2,090	810	2,900
CA	SIROV	7	7,129	4,867	230	49,903	34,069	1,610	4,820	1,880	6,700	33,740	13,160	46,900
OCA	Kodf. SVIETLANA	1				7,129	4,867	230				4,820	1,880	6,700
CL	LEIPZIG	1				4,385	3,553	136				3,370	1,230	4,600
CL	SAVOIA	1				4,385	3,553	136				3,370	1,230	4,600
CL	NEW CLASS	1				7,129	4,867	230				4,820	1,880	6,700
OCL	SVIETLANA	1			-	4,385	3,553	136				3,370	1,230	4,600
DD	TYPE 'B' (ex Jap.)	1				2,600	2,450	130				2,090	810	2,900
DD	TYPES 34-36-36A	4	2,600	2,450	130	10,400	9,800	520	2,090	810	2,900	8,360	3,240	11,600
DD	GNEVIERE	2	1,200	850	53	2,400	1,700	106	1,010	390	1,400	2,020	780	2,800
DD	"O"	6	1,734	1,571	78	10,404	9,426	468	1,150	450	1,600	6,900	2,700	9,600
DD	SKORYY - "7" - "7U"	32	1,734	1,571	78	55,488	50,272	2,496	1,150	450	1,600	36,800	14,400	51,200
DD	LENINGRAD	5	1,734	1,571	78	8,670	7,855	390	1,150	450	1,600	5,750	2,250	8,000
DD	TYPE 39	1				1,481	85	9				900	350	1,250
ODD	FUBUKI & LETOSHI	3	1,200	850	53	3,600	2,550	159	1,010	390	1,400	3,030	1,170	4,200
ODD	KIREBELLO & LENIN	8	1,200	850	53	9,600	6,800	424	1,010	390	1,400	8,080	3,120	11,200
SS	TYPE XXI	15	920	860	15	13,800	12,900	225	1,150	450	1,600	17,250	6,750	24,000
SS	"R" & "P"	12	841	864	28	10,092	10,368	336	1,010	390	1,400	12,120	4,680	16,800
SS	XI-C, VII-C; MAREA, "S", "L-2"	55	480	490	15	26,400	26,950	825	647	253	900	35,585	13,915	49,500
SS	SHCH	79	400	440	14	31,600	34,760	1,106	720	280	1,000	56,880	22,120	79,000
SS	"M" & MISCELL.	107	200	220	7	21,400	23,540	749	360	140	500	38,520	14,980	53,500
OSS	MISCELLANEOUS	9	400	440	14	3,600	3,600	126	720	280	1,000	6,480	2,520	9,000
DE	MISCELLANEOUS	39	1,481	85	9	57,759	3,315	351	900	350	1,250	35,100	13,650	48,750
	PG - PF - APD - AM	197	1,010	38	17	198,970	7,486	3,349	522	203	725	102,834	39,991	142,825
	TOTAL (1000 lbs.)							14,941						
	TOTAL (Short tons)					585,827	321,538	7,470.5	(Total man-hrs. - 1,000 Hrs.)- -			461,279	179,346	640,625
	TOTAL (Long tons)					523,056	287,085	6,670.0						
	NEW CONSTRUCTION 1949 - 1952													
BB	STRANA SOVIETOV	1				28,556	17,536	327				14,400	5,600	20,000
CA	PRINZ EUGEN	2	9,208	6,810	167	18,416	13,620	334	5,760	2,240	8,000	11,520	4,480	16,000
CA	SIROV	4	7,129	4,867	230	28,516	19,468	920	4,820	1,880	6,700	19,280	7,520	26,800
DD	NEW LARGE	5	2,600	2,450	130	13,000	12,250	650	2,090	810	2,900	10,450	4,050	14,500
DD	"O"	8	1,734	1,571	78	13,872	12,568	624	1,150	450	1,600	9,200	3,600	12,800
DD	SKORYY	6	1,734	1,571	78	10,404	9,426	468	1,150	450	1,600	6,900	2,700	9,600
DD	TYPE 41	6	1,481	85	9	8,886	510	54	900	350	1,250	5,400	2,100	7,500
DD	LENINGRAD	2	1,734	1,571	78	3,468	3,142	156	1,150	450	1,600	2,300	900	3,200
DE	REK & YASTREB	19	1,481	85	9	28,139	1,615	171	900	350	1,250	17,100	6,650	23,750
SS	TYPE XXI	25	920	860	15	23,000	21,500	375	1,150	450	1,600	28,750	11,250	40,000
SS	"S"	15	480	490	15	7,200	7,350	225	647	253	900	9,705	3,795	13,500
SS	SHCH	20	400	440	14	8,000	8,800	280	720	280	1,000	14,400	5,600	20,000
SS	"M"	50	200	220	7	10,000	11,000	350	360	140	500	18,000	7,000	25,000
	TOTAL (1000 lbs)							4,934						
	TOTAL (Short tons)					201,457	138,785	2,467	(TOTAL man-hours)- - - - -			167,405	65,245	232,650
	TOTAL (Long tons)					179,871	123,914	2,202.7	(1,000 Hrs.)					
	GRAND TOTAL (Short tons)					787,284	480,323	9,937.5	(GRAND TOTAL man-hours)- - -			628,684	244,591	873,275
	GRAND TOTAL (Long tons)					702,927	410,999	8,872.7	(1,000 Hrs.)					

1/ Does not include small combatant vessels or auxiliaries which appear on Page X-16.

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TABLE II

USSR NAVY - STEEL, ALUMINUM AND MAN-HOUR REQUIREMENTS FOR NAVAL ORDNANCE
(less Automatic Guns)

AMMUNITION, TORPEDOES, MINES and DEPTH CHARGES

AMMUNITION AVAILABLE - 1949

TYPE	WEIGHT OF STEEL IN AMMUNITION (in 1000 pounds)					Weight of Aluminum (in lbs.)	Man-Hours Required in Production
	Principal Combatant Ships	Auxiliaries and Minor	Total Mounted AFLOAT	Total in Coastal Defenses	TOTAL		
16" Rounds	-	-	-	7,290	7,290	472.5	264,600
14" "	-	-	-	16,000	16,000	1,400.	744,000
12" "	11,560	-	11,560	68,000	79,560	8,190.	2,714,400
10" "	600	-	600	45,000	45,600	10,640.	3,040,000
8" "	5,025	-	5,025	33,750	38,775	18,095.	3,619,000
6" "	3,150	3,150	6,300	60,000	66,300	46,410.	4,641,000
5" "	8,470	8,470	16,940	30,000	46,940	82,145.	2,347,000
4" "	6,697	6,697	13,394	10,000	23,394	163,758.	4,819,164
3" "	3,016	3,016	6,032	12,000	18,032	13,524.	5,680,080
TORPEDOES:							
21"	7,822.5	2,500	10,322.5	5,000	15,322.5	220,644.	152,544,681
18"	412.3	190	602.3	1,900	2,502.3	-	7,315,935
MINES	4,615	2,307.5	6,922.5	22,500	29,422.5	-	11,769,000
DEPTH CHARGES	3,350.6	1,675.4	5,026	-	5,026	-	2,513,000
TOTAL (1,000 pounds)	54,718.4	28,005.9	82,724.3	311,440	394,164.3	565.28	
TOTAL (long tons)	24,427.9	12,502.6	36,930.5	139,035.7	175,966.2	252.36	202,011,860 ---- (man-hours)

AMMUNITION REQUIRED FOR NEW CONSTRUCTION, 1949-1952

16" Rounds	4,860	-	4,860		4,860	315.	176,400
14" "	-	-	-		-	-	-
12" "	-	-	-		-	-	-
10" "	-	-	-		-	-	-
8" "	3,900		3,900		3,900	1,820	364,000
6" "	3,200	3,200	6,400		6,400	4,480	448,000
5" "	1,980	1,980	3,960		3,960	6,930	198,000
4" "	3,150	3,150	6,300		6,300	44,100	1,297,800
3" "	616	616	1,232		1,232	924	388,080
TORPEDOES:							
21"	3,465	2,500	5,965		5,965	85,896	59,385,154
18"	-	-	-		-	-	-
MINES	2,152	1,076	3,228		3,228	-	1,291,200
DEPTH CHARGES	660.4	330.2	990.6		990.6	-	495,300
TOTAL (1,000 pounds)	23,983.4	12,852.2	36,835.6		36,835.6	144.47	
TOTAL (long tons)	10,706.9	5,737.6	16,444.5		16,444.5	64.49	64,063,934 ---- (man-hours)
GRAND TOTAL (long tons	35,134.8	18,240.2	53,375	139,035.7	192,410.7	316.85	266,055,794 ---- (man-hours)

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TABLE III

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USSR NAVY - STEEL, ALUMINUM AND MAN-HOUR REQUIREMENTS FOR NAVAL ORDNANCE (Less Automatic Guns)

GUNS

GUNS AVAILABLE - 1949	WEIGHT OF STEEL IN GUNS (in long tons)					Weight of Aluminum*	Man-Hours Required**
TYPE	Principal Combatant Ships	Auxiliaries and Minor	Total Mounted - AFLOAT	Total in Coastal Defenses	Total		
16"/50	-	-	-	4,387.5	4,387.5		
14"/50	-	-	-	6,000	6,000		
12"/50	7,650	-	7,650	22,500	30,150		
10"/50	720	-	720	27,000	27,720		
8"/50	8,040	-	8,040	18,000	26,040		
6"/53	2,287	1,287	2,574	11,700	14,274		
5"/51	5,674.5	5,674.5	11,349	5,850	17,199		
4"/50	6,388.2	6,388.2	12,776.4	2,340	15,116.4		
3"/50	1,392	1,392	2,784	1,440	4,224		
TOTAL (long tons)	31,151.7	14,741.7	45,893.4	99,217.5	145,110.9		
GUNS REQUIRED FOR NEW CONSTRUCTION - 1949-1952							
16"/50	4,387.5	-	4,387.5	-	4,387.5		
14"/50	-	-	-	-	-		
12"/50	-	-	-	-	-		
10"/50	-	-	-	-	-		
8"/50	6,240	-	6,240	-	6,240		
6"/53	2,028	2,028	4,056	-	4,056		
5"/51	1,287	1,287	2,574	-	2,574		
4"/50	2,901.6	2,901.6	5,803.2	-	5,803.2		
3"/50	278.4	278.4	556.8	-	556.8		
TOTAL (long tons)	17,122.5	6,495.0	23,617.5	-	23,617.5		
GRAND TOTAL (long tons)	48,274.2	21,236.7	69,510.9	99,217.5	168,728.4		

* The use of aluminum in the construction of naval guns is insignificant and non-essential.

** No data available on which to estimate.

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TABLE IV

CURRENT OIL CONSUMPTION USSR NAVY - PEACETIME CONDITIONS

Compiled July, 1949

TYPE	NUMBERS EXISTING	NO. DAYS AT SEA PER YEAR	RATE OF FUEL CONSUMPTION AT SEA LONG TONS/DAY	NO. DAYS IN HARBOR IN YEAR	RATE OF FUEL CONSUMPTION IN HARBOR LONG TONS/DAY	FUEL CONSUMPTION PER SHIP LONG TONS PER ANNUM: AT SEA	IN HARBOR	TOTAL	TOTAL CONSUMPTION FOR EACH TYPE, LONG TONS PER ANNUM: OIL FUEL	DIESEL	PETROL	LUBE OIL (Note # 2)
BATTLESHIPS	3	20	192	345	39	384	13,455	13,839	41,517			23
MONITOR	1	0		365	See Note 1				5,000			2.8
CRUISERS	12	30	96	335	18	2,880	6,030	8,910	106,920			59.4
DESTROYERS	61	45	48	320	10	2,160	3,200	5,360	326,960			182
DESTROYER ESCORTS	39	45	24	320	6	1,080	1,920	3,000	117,000			65
SUBMARINES	277	60	12	305	1.1	720	336	1,056		292,512		5,096
SUB TOTAL									597,397	292,512		5,428
FLEET MINESWEEPERS, GUNBOATS, & FRIGATES	196	90	24	275	6	2,160	1,650	3,810		746,760		13,577
PT	470	100	9	265	0	900	0	900			423,000	7,690
SC	410	60	5	305	1	300	305	605		248,050		4,510
MOTOR GUNBOATS	260	30	5	335	1	300	335	635		165,100		3,000
MS	465	30	2	335	0.3	60	100	160		74,400		1,353
CM	5	20	80	345	5.7	1,600	1,966	3,566	17,830			9.9
ADM. FLAGSHIPS	3	20	39	345	5.9	780	2,035	2,815	8,445			.5
TANKERS	17	100	9.8	265	1.5	980	397	1,377	23,410			13.0
SMALL MINELAYERS	23	20	8	345	1.2	160	414	574		13,200		340
MISCELLANEOUS	Note No. 3 - Add 1% of total consumption											
TOTAL									647,082	1,540,022	423,000	35,606

TOTAL CONSUMPTION ---------- 2,645,710
Plus 1% for Miscellaneous (Note No. 3) ---------- 26,457
GRAND TOTAL ---------- 2,672,167

NOTES:

1. 5000 Tons consumption of fuel oil added for non-seagoing Monitor.
2. LubOil consumption based on U.S. naval ratios of 1,400 tons fuel oil per 1 ton LubOil in turbine drives and 55 tons fuel per 1 ton LubOil in Internal Combustion engines.
3. 1% of total consumption added for miscellaneous auxiliaries and small craft.
4. Naval air consumption not included.
5. Shore establishment consumption of POL not included due to insufficient data. However, it is considered a negligible amount compared to total consumption.

TABLE V

ESTIMATED OIL CONSUMPTION FOR USSR NAVY - 1952 - PEACETIME CONDITIONS

Compiled July 1949

TYPE	NUMBERS EXISTING	NO. DAYS AT SEA PER YEAR	RATE OF FUEL CONSUMPTION AT SEA LONG TONS/DAY	NO. DAYS IN HARBOR IN YEAR	RATE OF FUEL CONSUMPTION IN HARBOR LONG TONS/DAY	FUEL CONSUMPTION PER SHIP LONG TONS PER ANNUM: AT SEA	IN HARBOR	TOTAL	TOTAL CONSUMPTION FOR EACH TYPE, LONG TONS PER ANNUM: OIL FUEL	DIESEL	PETROL	LUBE OILS (Note # 2)
BATTLESHIPS	4	20	192	345	39	384	13,455	13,839	55,356			30.7
MONITOR	1	0		365	See Note 1				5,000			2.8
CRUISERS	18	30	96	335	18	2,880	6,030	8,910	160,380			891.0
DESTROYERS	87	45	48	320	10	2,160	3,200	5,360	466,320			2,590.
DESTROYER ESCORTS	55	45	24	320	6	1,080	1,920	3,000	165,000			917
SUBMARINES	378	60	12	305	1.1	720	336	1,056		399,168		7,294
SUB TOTALS									852,056	399,168	0	11,726

TOTAL 1,262,950

GRAND TOTAL (Note # 4) (Note 3) 3,769,906

NOTES:

1. 3000 Tons consumption of fuel oil added for non-seagoing Monitor.
2. LubOil consumption based on U.S. naval ratios of 1,600 tons fuel oil per 1 ton LubOil in turbine drives and 55 tons fuel per 1 ton LubOil in Internal Combustion engines.
3. 1% of total consumption included for miscellaneous auxiliaries and small craft.
4. Naval air consumption not included.
5. Shore establishment consumption of POL not included due to insufficient data. However, it is considered a negligible amount compared to total consumption.
6. Computation for grand total consumption for 1952 is based on the current ratio of fuel consumption of major combat vessels to minor and auxiliary vessels, assuming that ratio of major to minor and auxiliary vessels will be the same in 1952 as it is at present (1949).

C. SOVIET NAVY, 1949 - 1952 -- ONI RESPONSE TO JIGM - 130

1. In accordance with JIGM-130 a study of the present Soviet inventory of Naval equipment, and the requirements for steel, aluminum and man hours of labor for the estimated construction program from 1949 to 1952 and the estimated annual POL products requirements, is submitted herewith. That part of the study that applies to the Soviet Naval Air Force is being submitted as a separate section of the response by JANAID.

2. JIC 435/21 lists 87 destroyers and 55 destroyer escorts. Table I lists 89 destroyers and 58 destroyer escorts. This variation is accounted for in Table I by including two destroyers and 4 destroyer escorts to be scrapped because of overage plus the acquisition of one destroyer escort from Italy.

3. The Office of Naval Intelligence has recently revised its estimate of the Soviet submarine fleet by dropping 4 "A" Class submarines because of overage, changing the present total of operational submarines from 281 to 277. Also the 57 submarines previously believed to be available for training have been deleted in the new estimate of total submarine strength for 1952. The ONI estimate of the present Soviet submarine strength is therefore reduced to 277 in 1949 and to 378 in 1952, including obsolescent submarines.

4. Several ships listed in the new construction program are now partially completed. Information indicates that work may progress on one ship for a short time and then shift to another before again returning to the first. Because of this "piecemeal" type of work it is impossible to estimate a completion date for each ship. However, it is possible to estimate from past performances the total number and types likely to be completed over a period of years.

5. It is not possible to estimate the quantity of metals involved in the construction of the present building and fitting out yards nor the amount likely to be used in modernization of existing yards and in the construction of new yards. It is known that building yards do exist and that in the years prior to World War II their output exceeded the estimated construction program used in Table I.

U.S.S.R. - NAVY --STEEL, ALUMINUM AND MAN-HOUR REQUIREMENTS 1/
BY YEARS - - - 1949 to 1952

	STEEL			ALUMINUM	MAN HOURS (1,000 HRS.)		
	Carbon (Tons)	Alloy (Tons)	Total (Tons)	(Tons)	Skilled	Unskilled	Total
Requirements for New Naval Construction							
1949-50	95,494	61,583	157,077	1,132	90,881	35,249	126,130
1950-51	143,241	92,374	235,615	1,698	136,321	52,874	189,195
1951-52	238,736	153,957	392,693	2,829	227,203	88,122	315,325
					454,405		
Requirements for Guns, 3" and above							
1949-50	No Data	No Data	4,723	NIL	No Data	No Data	No Data
1950-51	No Data	No Data	7,085	NIL	No Data	No Data	No Data
1951-52	No Data	No Data	11,809	NIL	No Data	No Data	No Data
Requirements for Ammunition							
1949-50	No Data	No Data	3,289	13	No Data	No Data	12,809
1950-51	No Data	No Data	4,934	19	No Data	No Data	19,213
1951-52	No Data	No Data	8,222	33	No Data	No Data	32,022

1/ Based on the above data, total steel requirements for the calendar years 1949-1952 are: 137,573; 206,362; 330,179; and 550,299 tons respectively. Total aluminum requirements are: 948; 1,431; 2,289; 3,799 tons. The above table includes the requirements for all types of naval vessels.

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ANNUAL INCREASE IN OIL CONSUMPTION USSR NAVY DUE TO INCREASE IN NUMBER OF VESSELS
(In Long Tons)

TYPE	Increased To End of 1949	Increase In 1949 Oil Consumption	Increase During 1950	Increase In 1950 Oil Consumption	Increase During 1951	Increase In 1951 Oil Consumption
Battleships					1	13,839
Monitor						
Cruisers	1	8,910	2	17,820	3	26,730
Destroyers	5	26,800	9	48,240	12	64,310
Destroyer Escorts	2	6,000	7	21,000	7	21,000
Submarines (Diesel Oil)	36	38,016	37	39,072	28	29,568
Minor Combat & Auxiliaries		160,500		256,000		313,100
Lub Oil		1,500		2,334		3,000
TOTAL		241,726		384,466		471,547

The annual rate of consumption in long tons as of the first of January for the following years are given below by adding the increases as shown in the above table to the total 2,672,167 as given in Table IV compiled as of July, 1949.

	2,672,167
	241,726
1950	2,913,893
	2,913,893
	384,466
1951	3,298,359
	3,298,359
	471,547
1952	3,769,906

XI. APPENDICES

Appendix 1 - Steel Requirements

Appendix 2 - Method and Basis for Estimates of Transportation Aluminum Requirements

Appendix 3 - Petroleum Requirements of Soviet Agriculture 1949, 1950, 1951, and 1952

Appendix 4 - Method and Basis for Estimates of USSR Electric Power Requirements for Transportation

APPENDIX 1

STEEL REQUIREMENTS

Agriculture and Agricultural Machine Construction

It is assumed that "agricultural machine construction," a category used by the Soviets, includes combines, threshers, mowers and the like, whereas the category "agriculture" includes such equipment as plows, harrows and sickles. The Soviet book "Potreblenie Chernykh Metallov v SSSR," Moskva, 1940 uses these two categories in tables giving the prewar requirements of steel by the various industries:

USSR: Consumption of Ordinary and High-Grade Rolled Steel by Agriculture and the Agricultural Machine Construction Industry 1/
(In 1000 metric tons)

	Agriculture		Agr. Machine Const.		Total - Both Categories	
		Excluding Building		Excluding Building	Including Building	Excluding Building
Year	Total	Construction	Total	Construction	Construction	Construction
1932	238.0	234.2	53.8	47.4	291.8	281.6
1933	250.9	248.0	84.2	75.9	335.1	323.9
1934	254.6	253.2	127.3	116.2	381.9	369.4
1935	374.5	373.8	128.7	115.5	503.2	489.3
1936	572.5	570.9	118.8	101.9	691.3	672.8
1937	572.3	571.8	117.7	98.0	690.0	669.8
2/ 1938	478.9	478.4	114.6	83.3	593.5	561.7

The average annual rolled steel requirement for the two categories for the years 1934 to 1938 was 572,000 metric tons, including construction, and 553,000 metric tons excluding construction.

Production of agricultural machinery and equipment in 1950 is planned at 1,264 million rubles. This is 112 percent above the 1937 (highest prewar year in terms of ruble value) level of 597 million rubles.

It is considered unlikely that the over-all 1950 production goal for agricultural machinery and equipment will be met. Actual planned production of three items are given for 1950 and compared with 1938 production:

	1938 (units)	Plan 1950 (units)	1950 as a percentage of 1938 (%)
Tractor plows	72,800	110,000	151
Tractor cultivators	64,800	82,300	127
Tractor seeders	40,883	83,300	204

1/ Derived from "Potreblenie Chernykh Metallov v SSSR," Moskva, 1940, pp 20 to 23, inclusive.
2/ Data for 1938 incomplete by about 3-4 percent.

It is estimated that the total rolled steel requirements, including building construction, for the production of agricultural machinery and equipment will be as follows for 1949, 1950, 1951, and 1952:

Year	Rolled Steel Requirements (in metric tons)	Percentage (1938 = 100)
Average 1934-38	572,000	100
1949	658,000	115
1950	744,000	130
1951	858,000	150
1952	944,000	165

Tractor Industry

The information on prewar rolled steel requirements by the Soviet tractor industry in the book "Potreblenie Chernykh Metallov v SSSR", Moskva, 1940, pp. 20-21, was examined for one year (1938) in order to determine if steel for tank production might have been included in the tractor requirement.

Tractor production in 1938 is estimated to have been 58,300.1/ In order to estimate the breakdown of 1938 tractor production by type and weight of tractor, the distribution of tractors by make, as of 1 January 1941, was used as a base:

Make and Model	Numbers in Percent of Total 2/	Weight of Tractor 3/ (in kilograms)
Universal	17.7	2,000
STZ-KhTZ	61.8	2,630
ChTZ-S-60	9.0	9,526
SKhTZ-NATI	6.2	4,800
ChTZ-S-65-D12	2.8	10,500
KhTZ-T2G	2.0	5,000
ChTZ-SG-65	0.5	11,200

It is assumed that the production of tractors in 1938 tended toward the heavier models to serve as military prime movers in the event of war. It is estimated that the 1938 tractor production was distributed as follows by model:

1/ See "Draft Power in Soviet Agriculture", OIR Report No. 4704, July 21, 1948, Department of State, p. 20.
2/ From Table 6 (p. 25) of source cited in footnote 1/.
3/ From Table 3 (p. 21) of source cited in footnote 1/.

Make and Model	Numbers in Percent of Total
Universal	5
STZ-KhTZ	30
ChTZ-S-60	20
SKhTZ-NATI	20
ChTZ-S-65-D12	10
ChTZ-T2G	13
ChTZ-SG-65	2

In order to arrive at the total weight of all tractors produced in 1938, the following procedure was followed:

Model	Est. % of Total Production		Total No. Tractors Produced (Units)		No. of Tractors of Specified Model (Units)		Weight of One Tractor (Kilograms)		Weight of all Tractors (Metric Tons)
Universal	5%	of	58,300	=	2,915	x	2,000	=	5,830
STZ-KhTZ	30%	of	"	=	17,490	x	2,630	=	45,999
ChTZ-S-60	20%	of	"	=	11,660	x	9,526	=	111,073
SKhTZ-NATI	20%	of	"	=	11,660	x	4,800	=	55,968
ChTZ-S-65-D-12	10%	of	"	=	5,830	x	10,500	=	61,215
KhTZ-T2G	13%	of	"	=	7,579	x	5,000	=	37,895
ChTZ-SG-65	2%	of	"	=	1,166	x	11,200	=	13,059
Totals	100%				58,300				331,039

Thus, the total weight of all tractors produced in the USSR in 1938 is estimated to have been approximately 330,000 metric tons.

In order to estimate what portion of the 330,000 metric tons is steel, American standards were used. The steel portion required for American tractors ranged from 46.3 percent in the wheel type tractor with steel tires over 30 horsepower to 65.1 percent in the tracklaying tractor under 50 horsepower. 1/ For the average Soviet tractor, the percentage of steel is estimated at 50 percent. Thus, 50 percent of 330,000 metric tons means that 165,000 metric tons of the total weight of the Soviet tractors was steel.

Assuming that wastage and rejects were about 25 percent above the American standards, steel requirements were 206,000 metric tons (165,000 metric tons x 125 percent).

1/ Derived from "Farm Machinery Equipment Industry - Summary of Material Requirements for the Years 1942, 1941, and 1940", prepared by the Priorities Committee of the Farm Equipment Institute and submitted to the United States Department of Agriculture, September 22, 1941.

The amount of steel required for spare parts and attachments by the American tractor industry was 23 percent of the total steel required.1/ It is assumed that Soviet agricultural tractors require about double the number of spare parts needed by American tractors because of the poorer quality of Soviet tractors and the longer and harder use to which they are put. This means that an additional 46 percent of the total amount of steel required in the USSR in 1938 for the tractor industry was for spare parts and attachments. Thus, 46 percent of 206,000 metric tons equals 95,000 metric tons.

The total amount of steel required for the Soviet tractor industry in 1938, therefore, was 206,000 metric tons (for tractors) plus 95,000 metric tons (for spare parts and attachments) or a total of 311,000 metric tons.

Using a factor of 0.74 to convert raw steel into rolled steel, gives a calculated total USSR rolled steel requirement in 1938 of 230,000 metric tons (311,000 metric tons x 74 percent). This compares to the published Soviet figure of 229,500 metric tons.2/ Despite any reasonable errors made in any of the above assumptions, it is safe to assume that the rolled steel requirements for the tractor industry in 1938, as published by the Soviets, does not include rolled steel for the manufacture of items other than for tractors.

Then, if 229,500 metric tons of rolled steel were required in 1938 for the manufacture of 58,300 tractors, the amount of rolled steel per tractor was 3,937 kilograms.

To arrive at total rolled steel requirements for the USSR tractor industry in 1949, 1950, 1951, and 1952, the following estimates were made of tractor production and of the amount of rolled steel required per tractor. In view of the trend towards tractors of greater horsepower, the amount of rolled steel per tractor was increased from 4,000 kilograms in 1949 (slightly above the 1938 level) to 4,300 kilograms in 1952.

Year	Tractor Production (Units)	Amount of Rolled Steel Per Tractor (Kilograms)	Total Rolled Steel Required (Metric Tons)
1938	58,300	3,937	229,500
1949	78,200	4,000	313,000
1950	88,000	4,100	361,000
1951	100,000	4,200	420,000
1952	112,000	4,300	482,000

1/ Derived from "Farm Machinery Equipment Industry - Summary of Material Requirements for the Years 1942, 1941 and 1940", prepared by the Priorities Committee of the Farm Equipment Institute and submitted to the United States Department of Agriculture, September 22, 1941.

2/ "Potreblenie Chernykh Metallov v SSSR", Moskva, 1940, pp. 20 to 23, cites a 1938 requirement of rolled steel by the tractor industry of 51,500 metric tons of ordinary rolled steel and 178,000 metric tons of high-grade rolled steel, or a total of 229,500 metric tons.

Transportation, Method, and Basis for Estimates

1. Railroads

In order to estimate total steel requirements for the railroads, it is necessary to determine production of locomotives and cars in the years 1949 through 1952, total inventories for those years, and the number of kilometers of track and bridges constructed during that period.

Electric locomotive production has been estimated at a rate which will see the completion of the 1950 plan in that year. The increase in the production rate shown in 1950 over 1949 has been projected into 1951 and 1952 with the total inventory reaching 1413 electric locomotives in the latter year.

TABLE 1

Electric Locomotives, 1949-52

Year	Production	Total Inventory
1949	206	495
1950	256	751
1951	306	1,057
1952	356	1,413

At the end of 1946, 129 Diesel-electric locomotives were available for use on the Soviet railroads. This figure includes 26 imported between 1927 and 1933, 86 locomotives supplied under Lend-Lease, and 17 produced domestically. Two Diesels have been reported produced in 1947 and 5 in 1948. It is estimated that production in 1949 and 1950 will be 10 and 20 locomotives respectively and that the annual increase in the production rate will continue through 1952.

TABLE 2

Diesel Electric Locomotives, 1949-52

Year	Production	Total Inventory
1949	10	146
1950	20	166
1951	30	196
1952	40	236

Planned steam locomotive production of 1600 units in 1949 and 2200 in 1950 has been accepted, with the total inventory for those years becoming 28,500 in 1949 and 30,500 in 1950. Estimated production in 1951 and 1952 has been calculated through the determination of a factor of utilization for the years 1947-50 and the projection of that factor into 1951 and 1952. This has been done by expressing all locomotives in terms of steam units, at a ratio of 2.5 to 1 for electric and Diesel equipment, and dividing the annual traffic by the average number of serviceable locomotives available during each year.

Table 3

Locomotive Utilization, 1947-50

Year	Serviceable 1/ Locomotives (expressed as steam units)	Traffic (billion ton-kms)	Ton-Kms per Locomotive (million)
1947	24,051	361.4	15.0
1948	24,881	417.4	16.8
1949	26,265	474.8	18.1
1950	28,303	532.0	18.8

Traffic for 1951 and 1952 has been estimated by assuming a close relationship between railroad traffic and the index of gross industrial output as 576.4 billion ton-kilometers in 1951 and 624.6 billion in 1952. With a view to the fact that comparable US locomotive utilization factors are well above these Soviet factors, the latter were projected into 1951 and 1952 as 19.2 and 19.4 respectively. Applying these factors to the planned traffic, it becomes evident that a total of 30,020 locomotive units will be required in 1951 and 32,195 in 1952. Diesel and electric locomotive production being accepted as estimated above, this would mean a required steam locomotive production of 584 units in 1951 and 3020 in 1952. It is unrealistic to assume that such a fluctuation in production will occur; hence it is estimated that the required production in 1951 and 1952 will be evenly divided between the two years.

Table 4

Steam Locomotives, 1949-52

Year	Production	Excess of Production over Increase in Inventory	Total Inventory
1949	1,600	300	28,500
1950	2,200	200	30,500
1951	1,802	300	32,002
1952	1,802	300	33,504

Freight car production and inventory figures were calculated by the same method used in the case of steam locomotives, with the acceptance of 1949 and 1950 planned figures and the use of a utilization factor in determining 1951 and 1952 production and inventory.

1/ 90% of total.

TABLE 5

Freight Cars, 1949-52
(two-axle units)

Year	Production	Excess of Production over Increase in Inventory	Total Inventory
1949	110,000	14,400	950,900
1950	146,000	36,900	1,100,000
1951	115,011	30,000	1,185,011
1952	115,011	25,000	1,275,022

Similar methodology was followed in estimating passenger car requirements, with the assumptions that planned goals will be achieved in 1950, and that the utilization factor (the number of passenger-kilometers per passenger car) will maintain a consistent rate of increase in 1951 and 1952.

TABLE 6

Passenger Cars, 1949-52
(units)

Year	Production	Excess of Production over Increase in Inventory	Total Inventory
1949	1,700	500	38,200
1950	2,600	1,600	39,200
1951	1,850	1,050	40,000
1952	1,200	500	40,700

The Five Year Plan calls for the laying of 50,000 kilometers of new rail by the end of 1950. It was assumed, for the purpose of estimating steel requirements, that the Plan will be accomplished, with 10,000 kilometers being installed in 1948, 11,000 in 1949, and 12,000 in 1950. It was further assumed that the 12,000 kilometer rate will be maintained in 1951 and 1952.

The current plan provides for the use of 570,000 tons of steel in railroad bridge construction and restoration during the five year period, 1946-50. It is assumed that this will be accomplished. Of the 570,000 tons, 330,000 are to be used in restoration and 240,000 in new construction. If an average amount of steel was consumed in 1948, figures for 1949 and 1950 will be 125,400 and 136,800 respectively. On the assumptions that restoration will be completed by 1950 and that new construction will consume as much steel during the five years, 1951-55 as in the period 1946-50, it is estimated that 107,200 and 77,600 tons of steel will be used for new rail bridge construction in 1951 and 1952.

In order to estimate the steel requirements of the other segments of the Soviet railroad industry, various factors were used, derived from the sources indicated below.

a. Locomotive production -- a factor of 134 gross tons of steel per locomotive was used, derived from statistics on United States production and consumption of materials by the industry contained in the 1939, United States Census of Manufactures.

b. Freight car production -- a factor of 20.5 gross tons per 4-axle unit, derived from the same source, was used. The assumption was made that cars currently being produced are of all steel construction.

c. Passenger cars -- a factor of 34 finished tons per car was used. The Bolshoy Atlas gives the tare weight of the average Soviet 4-axle passenger car as 40 tons. Fifteen percent of the tare weight of a freight car consisting of iron, 6 tons were deducted from the 40. The assumptions were made that passenger cars now in production are exclusively 4-axle units and of all steel construction.

d. Rails -- It was assumed that new rails laid in 1949 will average 45 kilograms per meter and that those installed in 1950, 1951, and 1952 will average 50 kilograms per meter. In each year an additional 40% was allowed for rail accessories, an estimate in accord with US practice.

e. Repair of Rolling Stock -- factors of 8.25 ingot tons per locomotive and .53 ingot tons per 2-axle freight car were used. Passenger car and miscellaneous repairs account for an additional 10%. These factors were derived from material presented in OSS, R and A No. 1355.4, Russian Capabilities and Prospects, Part III, Basic Industries, 11 July 1944.

TABLE 7

Steel Requirements, Railroads

	1949	1950	1951	1952
Locomotives				
Production (units)	1,816	2,476	2,138	2,198
Factor of steel per unit	134	134	134	134
Steel (gross tons)	243,344	331,784	286,492	294,532
Freight Cars				
Production (4-axle units)	55,000	73,000	57,506	57,506
Factor of steel per unit	20.5	20.5	20.5	20.5
Steel (gross tons)	1,127,500	1,496,500	1,178,873	1,178,873
Passenger Cars				
Production (4-axle units)	1,700	2,600	1,850	1,200
Factor of steel per unit	34	34	34	34
Steel (finished tons)	57,800	88,400	62,900	40,800
Rails				
Kilometers installed	11,000	12,000	12,000	12,000
Factor of steel per km.	125.4	138.7	138.7	138.7
Steel (finished tons)	1,379,400	1,664,400	1,664,400	1,664,400
Bridges				
Steel (finished tons)	125,400	136,800	107,200	77,600
Repair of Rolling Stock				
Locomotives				
No. midyear	28,383	30,279	31,727	33,595
Factor of steel per unit	8.25	8.25	8.25	8.25
Steel (ingot tons)	234,160	249,802	261,748	277,159
Freight Cars				
No. midyear	942,100	1,044,450	1,122,602	1,210,113
Factor of steel per unit	.53	.53	.53	.53
Steel (ingot tons)	499,313	553,959	594,979	641,360
Total (cars and locos)	733,473	803,361	856,727	918,519
Passenger Cars and miscellaneous (10%)	73,347	80,336	85,673	91,852
Total (ingot tons)	806,820	883,697	942,400	1,010,371
Total				
Gross tons	1,370,844	1,828,284	1,465,365	1,473,405
Gross tons finished (85%)	1,165,217	1,554,041	1,245,560	1,252,394
Ingot tons	806,820	883,697	942,400	1,010,371
Ingot tons finished (70%)	564,774	618,588	659,680	707,260
Total tons finished	3,292,591	4,062,229	3,739,740	3,742,454
Total tons ingot (143%)	4,708,405	5,808,987	5,347,628	5,351,709

2. Motor Transport

The total steel requirements of the Soviet Automotive Industry, including production of vehicles and spare parts, are stated for the year 1938 in Shulkin, "Potreblenie Chernykh Metallov". As 210,936 motor vehicles were produced in 1938, a unit norm can be established for the total consumption of the automotive industry in the USSR in 1948 as follows:

Product	Total Consumption	Unit Requirements
Ordinary Steel	109,600	.52
Quality Steel	384,200	1.82
Steel Pipe	14,200	.07
Iron Pipe	1,300	.01
Iron and Ferroalloys	112,400	.53
Total	621,700	2.95

Since 1938, the consumption per automotive unit has been affected by the production of heavier trucks, economies in the use of steel by the substitution of wood and other materials, and by the production of lighter automobiles. The heavier trucks which are currently being produced are of a military type, similar to the US 2 1/2 ton 6x6 truck, and, therefore, require less steel than completely enclosed trucks. For the present, it appears advisable to accept the 1938 norms for motor vehicle requirements and apply them to estimated annual production.

In the US, where passenger cars rather than truck production predominates, a norm of 2.2 metric tons per unit, including production and spare parts, was established on the basis of 1939 production, according to the Census of Manufactures, 1939. The Soviet figure of 2.95 tons per vehicle, including production and spare parts, does not appear out of line when consideration is given to the fact that the weight in production is in trucks.

Estimated steel requirements, excluding the requirements for 30,000 military trucks which are included with military requirements, are shown in the following table.

TABLE 8

Metal Requirements in Civilian Vehicle Industry

Year	Production 1/ No. of Motor Vehicles	Less Military Vehicles	Ordinary Rolled Steel	Quality Rolled Steel	Steel Pipe	Iron Pipe	Iron-Ferroalloys	Total (Finished Steel
1949	300,000	270,000	140,400	491,400	18,900	2,700	143,100	793,800
1950	400,000	370,000	192,400	673,400	25,900	3,700	196,100	1,087,800
1951	500,000	470,000	244,400	855,400	32,900	4,700	249,100	1,381,800
1952	500,000	470,000	244,400	855,400	32,900	4,700	249,100	1,381,800

1/ For a discussion on the method of estimating vehicle production, see Motor Transport, Petroleum report.

3. Inland Waterways

In order to estimate the total steel requirements for the inland waterways it is necessary to obtain information on the number and type of vessels constructed each year and the amount of repair work done on the existing fleet.

The current Five-Year Plan provides for an increase in inventory of 300,000 horsepower to the self-propelled fleet and 3,000,000 tons of carrying capacity to the non-self-propelled fleet. Assuming that this production will be achieved, there will be at the end of 1950 a total of 910,000 horsepower in the self-propelled fleet and 6,800,000 tons of carrying capacity in the non-self-propelled fleet. 1/ The estimated amount of production required in 1949 and 1950 to achieve this inventory and the amount of production required in 1951 and 1952 to provide estimated traffic 2/ based on the 1950 utilization factor of self-propelled vessels and barges are shown in the following tables:

Table 9

MID-YEAR INVENTORY OF FLEET AND UTILIZATION PER UNITS OF TRAFFIC

	Mid-Year Inventory				Traffic, Ton-Kms.		
	Self-Propelled (horsepower)		Barges (Mil. tons carrying capacity)		Total (000 000 000)	Per HP (000)	Per Ton (000)
Year	Total	Serviceable Total (90%)	Total	Serviceable Total (90%)			
1949	820,000	738,000	5,900	5,310	41.3	56.0	7.8
1950	880,000	792,000	6,500	5,850	49.6	62.6	8.5
1951	953,141	857,827	7,020	6,318	53.7	62.6	8.5
1952	1,033,013	927,712	7,608	6,847	58.2	62.6	8.5

Table 10

END OF YEAR INVENTORY OF FLEET, REQUIRED ANNUAL INCREASE IN INVENTORY AND PRODUCTION

Year	End of Year Inventory		Increase B			Retirement 3% B		Production B	
	Self-Propelled (Horsepower)	Barges (Mil. tons carrying capacity)	SP (HP)	(000 000) (tons)	SP (HP)	(000 000) (tons)	SP (HP)	(000 000) (tons)
1949	850,000	6.200	60,000	.600	22,700	.168	82,700	.768
1950	910,000	6.800	60,000	.600	25,500	.186	85,500	.786
1951	996,282	7.240	86,282	.440	27,300	.204	113,582	.644
1952	1,069,744	7.976	73,462	.736	29,886	.217	103,350	.953

Although there is considerable current information on individual ships and barges in the fleet and on individual types being constructed, there are no over-all data on the composition of the fleet by types of ships and on actual or planned production by types of ships.

25X1X7

1/ [redacted]

2/ Estimated traffic in 1951 and 1952 has been based on the growth in gross industrial output in those years.

Therefore in order to estimate the amount of steel required annually for the production of river vessels it has been necessary to make some arbitrary assumptions based in part on known specifications of specific ships in the fleet and the prewar composition of the fleet as follows:

a. 45 percent of the production of barges will be of steel construction. The amount of steel required per ton of carrying capacity constructed will average .65 metric tons.

b. 55 percent of the production of barges will be primarily of wooden construction. The amount of steel required per ton of carrying capacity constructed will average .011 metric tons.

c. The amount of steel required per horse power of self-propelled vessels constructed will average .38 metric tons.

By applying these factors to required production shown in Table 2, the following steel requirements are obtained:

TABLE 11

Finished Steel Requirements for River Vessel Construction
(Metric Tons)

Year	Barges			Self-Propelled Vessels	Total Finished Steel
	Wood	Steel	Total		
1949	4,646	224,640	229,286	31,426	260,712
1950	4,755	229,905	234,660	32,490	267,090
1951	3,896	188,370	192,266	43,161	237,427
1952	5,766	278,752	284,518	39,273	323,791

No data of any kind are currently available on the over-all amount of steel used in the repair of inland waterway vessels. While admittedly inadequate, a rough estimate of the amount of steel needed might be obtained by adopting the repair factor used in estimating the amount of steel used in railroad locomotive repair. This factor should be applied to the total inventory of vessels. As applied to the various type of vessels it is as follows:

a. For barges of steel construction, .027 metric tons of steel per ton of carrying capacity.

b. For barges of wooden construction, .00044 metric tons of steel per ton of carrying capacity.

c. For self-propelled vessels, .016 metric tons of steel per horse-power.

On the basis of the above factors as applied to the mid-year inventories shown in Table 9, the annual steel repair requirements for vessels of the river fleet will be as follows:

TABLE 12

Steel Repair Requirements for Repair of the River Fleet
(Metric Tons of Finished Steel)

Year	Barges*	Self-Propelled Vessels	Total
1949	49,507	13,120	62,627
1950	54,652	14,080	68,732
1951	59,000	15,250	74,250
1952	63,965	16,528	80,493

* For the purpose of this estimate steel barges are assumed to amount to 30 percent of the total inventory.

4. Pipelines.

Pipeline mileage added after 1 January 1949 was estimated as described in the Electric Power report and converted to kilometers as shown below.

TABLE 13

Pipeline Construction, 1949-52
(Kilometers)

	1949	1950	1951	1952
Oil Line	1003.9	1095.1	563.8	516.8
Gas Line	178.6	194.7	194.7	194.7
Total	1182.5	1289.8	758.5	711.5

The oil pipe laid between 1949 and 1952, it was assumed, will be 12 inches in diameter and the gas pipe 18 inches. Twelve inch pipe requires 55 metric tons of steel per kilometer and 18 inch pipe 77 tons.[1] To these requirements were added 4 tons per kilometer used in pipeline construction in the form of structural shapes and plates, largely for storage facilities.[2] Total steel requirements for pipelines were then estimated as follows:

Pipeline Steel Requirements 1949-52
(Metric Tons)

	1949	1950	1951	1952
Oil Pipe	59,236	64,605	33,276	30,503
Gas Pipe	14,467	15,771	15,771	15,771
Total	73,703	80,376	49,047	46,274

1/ C. M. Wilson, Oil Across the World; New York, 1946, p. 289.
2/ Petroleum Data Book, 1948, p. II-101.

5. Civil Aviation.

The steel requirements for civil aviation have been computed on the basis of maintaining an inventory of 3h00 aircraft in each of the four years; 1949-52. US factors comparable to those used in computing military aircraft requirements for steel were used also in the case of civil aviation. The annual production of civil aircraft amounts to some 357 units. The increase in steel requirements for 1951 and 1952 is attributable to the estimated increased emphasis in the production of larger type aircraft in those years.

6. Shipping.

Production of merchant ships is estimated to amount to 25,000 gross tons per year. Based on the amount of steel required to build a Liberty Ship in the United States 1/, it appears that a gross ton of shipping will require .62 metric tons of steel. Applying this factor to the annual total gross tonnage estimated as being built, an annual ship building requirement for finished steel of 15,500 metric tons is obtained.

This figure has been doubled in order to make an allowance for ship repair, so that the estimated requirement for ship repair is 31,000 metric tons of finished steel.

1/ A Liberty ship of 7200 gross tons requires 5000 tons of steel for its construction. United States Maritime Commission.

TABLE 14

USSR Transportation Requirements for Steel

Type of Facility	Unit	1949	1950	1951	1952
Railroads	Metric Tons				
Finished Steel	" "	3,292,591	4,062,229	3,739,740	3,742,454
Ingot Steel 1/	" "	4,708,405	5,808,987	5,347,828	5,351,709
Motor Transport					
Finished Steel 2/	" "	793,800	1,087,800	1,381,800	1,381,800
Ingot Steel 1/ 2/	" "	1,135,260	1,555,680	1,976,100	1,976,100
Inland Waterways					
Finished Steel	" "	323,339	335,822	311,677	404,284
Ingot Steel 1/	" "	462,375	480,225	445,698	578,126
Pipe Lines					
Finished Steel	" "	73,703	80,376	49,047	46,274
Ingot Steel 1/	" "	105,395	114,938	70,137	66,172
Civil Aviation					
Finished Steel	" "	2,566	2,566	3,124	3,124
Ingot Steel 3/	" "	6,483	6,483	7,892	7,892
Shipping					
Finished Steel	" "	46,500	46,500	46,500	46,500
Ingot Steel 1/	" "	66,495	66,495	66,495	66,495
Total					
Finished Steel	" "	4,532,499	5,615,293	5,531,888	5,624,436
Ingot Steel	" "	6,484,413	8,032,808	7,914,150	8,046,494

1/ Converted from finished steel at ratio of 7 tons of finished to 10 tons of ingot.
2/ Excludes estimated military requirements for trucks.
3/ Converted from finished steel at ratio of 4 tons of finished to 10 tons of ingot.

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ESTIMATED AMOUNT OF ROLLING MILL PRODUCTS WHICH COULD BE SPARED FOR SOVIET USE WITHOUT ENDANGERING PRESENT SATELLITE ECONOMY. 1/
(In Metric Tons)

Country	1949	1950	1951	1952	1st Half 1952
Czechoslovakia 1/	390,937	412,912	456,940	529,200	265,000
Poland 2/	292,500	351,000	409,500	487,500	243,750
Hungary 3/	97,500	120,656	133,087	146,250	73,125
Total:	780,937	884,568	999,527	1,162,950	581,875

Note: Albania has no steel industry.

Bulgaria has no smelting and refinery capacity at present. However, plans exist for the development of a small industry by the end of the Five Year Plan in 1953, which will have a production goal of only 10,000 metric tons of raw steel.

Finland. Even after planned expansion of the steel industry has been realized, domestic production will not satisfy more than 50 per cent of Finnish requirements.

Rumania. Production facilities are and will be insufficient to meet domestic needs.

Yugoslavia. Information on iron and steel production is meager and clouded by the political situation. It is felt that whatever the political developments, Yugoslav economy will not permit exports of steel products.

1/ Based on an estimate procured from CO Special Case 2563, who estimated that 25 percent of rolling mill products allocated to the metal and machine, handicraft, transportation and construction industries could be sent to the USSR without endangering present Czech economy. That percentage was applied also to Poland and Hungary.

2/ Twenty-five percent of rolling mill products allocated to communications, reconstruction, navigation, coal, metal and miscellaneous industries.

3/ Twenty-five percent of rolling mill products allocated to railways, bridge building, mining, vehicles, agriculture, construction and public works, steel industry, electrical projects, consumer goods and awaiting allocation.

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Table 15

CZECHOSLOVAKIA
ESTIMATED ALLOCATION OF ROLLING MILL PRODUCTS 1949-1952 INCL.

Based on Office Estimate of Production of Rolled Products

Branch of Industry	1949		1950		1951		1952	
	Metric tons	% of total	Metric tons	% of total	Metric tons	% of total	Metric tons	% of total
Metal & Machine	1,046,250	46.5	1,110,200	48.8	1,251,900	53.5	1,458,000	54
Handicraft	121,500	5.4	120,575	5.3	121,680	5.2	145,800	5.
Transport	234,000	10.4	238,875	10.5	234,000	10	297,000	11
Construction	162,000	7.2	182,000	8.	180,180	7.7	216,000	8.
Maintenance 1/	193,500	8.6	197,925	8.7	203,580	8.7	216,000	8.
Export	438,750	19.5	373,100	16.4	294,840	12.6	297,000	11
Reserve	9,000	.4	11,375	.5	11,700	.5	18,900	.7
Wastage	11,250	.5	9,100	.4	9,360	.4	13,500	.5
2d Class Material	9,000	.4	9,100	.4	9,360	.4	10,800	.4
Tolerance (error)	24,750	1.1	22,750	1.	23,400	1.	27,000	1.
Total	2,250,000		2,275,000		2,340,000		2,700,000	

Note: The percentages used in this chart were based on documentary reports of the Czech State Planning office for the Five Year Plan, which allocated rolling mill products, for planning purposes, to the various industries. Those percentages were applied to the overall estimate of rolling mill production made by Br/EE, ORE, CIA, which is a reduction in production of the targets for the Czech Five Year Plan.
Sources: MA Praha R 480 31 Oct. 48 Praha State Despatch 720, 4 Nov. 48 - OOW 1612, 29 April 49

1/ Includes maintenance of the following industries: mining; metallurgy; electric power; chemical; glass; ceramics; wood, textile; paper, leather and rubber; food and agriculture.

Table 16
POLAND - ALLOCATION OF ROLLED PRODUCTS

Branch of Industry	1946 1/		1947 1/		1948 Est.		1949 Est.		1950 Est.		1951 Est.		1952 Est.	
	Metric tons	% of total	Metric tons	% of total	Metric tons	% of total	Metric tons	% of total	Metric tons	% of total	Metric tons	% of total	Metric tons	% of total
Communications	140,100	(17.3)	181,500	(15.7)	199,750	(17) 3/	255,000	(17)	306,000	(17)	357,000	(17)	425,000	(17)
Reconstruction	15,600	(2.)	32,200	(2.8)	35,250	(3)	52,500	(3.5)	63,000	(3.5)	73,500	(3.5)	87,500	(3.5)
Navigation	4,400	(.5)	13,800	(1.2)	23,500	(2)	45,000	(3)	54,000	(3)	63,000	(3)	75,000	(3)
Coal	88,000	(10.8)	148,700	(12.8)	129,250	(11) 3/	180,000	(12)	216,000	(12)	252,000	(12)	300,000	(12)
Metal Industry:	302,500	(37.4)	385,700	(33.1)	446,500	(38) 3/	570,000	(38)	684,000	(38)	798,000	(38)	950,000	(38)
Rail Rolling Stock Equipment	(126,600)	(16)	(122,300)	(10.5)	(164,500)	(14)	(210,000)	(14)	(252,000)	(14)	(294,000)	(14)	(350,000)	(14)
Castings 4/	(24,800)	(3.)	(47,000)	(4.)	(52,875)	(4.5)	(67,500)	(4.5)	(81,000)	(4.5)	(94,500)	(4.5)	(112,500)	(4.5)
Wire and Nail Factories	(47,100)	(6.)	(71,400)	(6.2)	(76,375)	(6.5)	(97,500)	(6.5)	(117,000)	(6.5)	(136,500)	(6.5)	(162,500)	(6.5)
Screws, rivets and wrought parts	(40,900)	(5.)	(49,500)	(4.3)	(52,875)	(4.5)	(67,500)	(4.5)	(81,000)	(4.5)	(94,500)	(4.5)	(112,500)	(4.5)
Sheet Steel Products	(28,000)	(3.5)	(39,100)	(3.4)	(41,125)	(3.5)	(52,500)	(3.5)	(63,000)	(3.5)	(73,500)	(3.5)	(87,500)	(3.5)
Agricultural Machinery	(19,200)	(2.4)	(36,100)	(3)	(37,600)	(3.2)	(48,000)	(3.2)	(57,600)	(3.2)	(67,200)	(3.2)	(80,000)	(3.2)
Boilermaking	(13,900)	(1.7)	(20,300)	(1.8)	(21,150)	(1.8)	(27,000)	(1.8)	(32,400)	(1.8)	(37,800)	(1.8)	(45,000)	(1.8)
Stockpiles	65,000	(8)	88,600	(7.6)	94,000	(8)	120,000	(8)	144,000	(8)	168,000	(8)	200,000	(8)
Exports	77,000	(9.5)	104,700	(9)	159,800	(13.6) 2/	210,000	(14)	252,000	(14)	294,000	(14)	350,000	(14)
Miscellaneous Industry	114,800	(14.2)	207,400	(17.7)	86,950	(7.4)	67,500	(4.5)	81,000	(4.5)	94,500	(4.5)	112,500	(4.5)
Total	807,700		1,166,600		1,175,000		1,500,000		1,800,000		2,100,000		2,500,000	

1/ Source: Yearbook of Industry of Regenerated Poland, 1948. FDB Translation 37749.
2/ Source: Warsaw SD 12 16 Mar. 49 (Report gave 11 months export total of 144,965 metric tons for rolled products).
3/ Source: [redacted] Central Administration of Foundries announced percentages for communications, coal and metal industries.
4/ Castings are not rolled steel, but they were included in tables contained in (1) and therefore retained throughout this chart for unity.

25X1X4

Table 17

HUNGARY
ESTIMATED ALLOCATION OF ROLLING PRODUCTS - 1948-1952 INCL.

Industry	1948 1/ Metric tons	% of total	1949 Metric tons	% of total	1950 Metric tons	% of total	1951 Metric tons	% of total	1952 Metric tons	% of total
Reparations Direct and Indirect	102,150	22.7	2/		2/		2/		2/	
Exports	99,000	22	110,000	22	136,125	22	150,150	22	165,000	22
Domestic Industrial:										
Railways	38,700	8.6	65,000	13	80,438	13	88,725	13	97,500	13
Bridge Bldg.	7,200	1.6	15,000	3	18,563	3	20,475	3	22,500	3
Mining	12,600	2.8	25,000	5	30,938	5	34,125	5	37,500	5
Vehicles	900	.2	10,000	2	12,375	2	13,650	2	15,000	2
Agriculture	2,250	.5	10,000	2	12,375	2	13,650	2	15,000	2
Const. & Public Works	450	.1	5,000	1	6,187	1	6,825	1	7,500	1
Req. of Steel Ind.			5,000	1	6,187	1	6,825	1	7,500	1
Electrical Projects	5,400	1.2	15,000	3	18,562	3	20,475	3	22,500	3
Consumer Goods	145,800	32.4	190,000	38	235,125	38	259,350	38	285,000	38
Awaiting allocation	35,550	7.9	50,000	10	61,875	10	68,250	10	75,000	10
Total	450,000		500,000		618,750		682,500		750,000	

Note: Production is estimate of Br/EE, ORE, CIA. Five Year Targets were scaled down to an estimated realistic production.

25X1X4 1/ Based on documentary source, [redacted] and MA Budapest report R85-49, 1 Mar. 49. Reports covered July, August, September and December 1948. Percentages were applied to full year production.

2/ Reparations payments dropped. In July 1948, 50 percent of Hungary's war debt to the USSR was cancelled as of January 1, 1949 and reportedly the remainder is to be paid in agricultural produce in order for Hungary to use savings in building up industrial economy.

METHOD OF COMPUTATION

CZECHOSLOVAKIA:

The percentages used in this chart were obtained from a documentary report procured from the Czech State Planning Office, which allocated rolling mill production, for planning purposes, to the various Czech industries. The original document applied those percentages to the production targets of the individual years of the Five Year Plan. Those targets are considered unrealistic, considering the present capacity of the Czech iron and steel industry and the inability of the Czech government to obtain installations and equipment from the West to expand present capacity, and they were revised downward by this office to a more sound production estimate. The percentage figures of the original document were then applied to the revised production estimate for the purpose of this project.

POLAND:

Allocation of rolled products to Polish industry for the years 1946 and 1947 and total rolling mill production were announced in an official publication of the Polish statistical bureau. The percentage of production to be allocated to the communications, coal and metal industries for 1948 were announced by the Polish Central Administration of Foundries, and the total amount of exports of rolled products for January through November 1948 was also announced. Based on these announcements and the known percentages for 1946 and 1947, the proportion of distribution was estimated for the other Polish industries and applied to an estimate of over-all production made by this office. This estimate was predicated on several calculated estimates of 1948 production. With minor changes, those percentages for 1948 were applied to estimated rolling mill production for the years 1949 through 1952.

HUNGARY:

Allocation of Hungarian rolling mill products for July, August, September and December was procured from documentary sources. From those representative four months for 1948, a yearly percentage was reached which was applied to over-all production for that year.

In July 1948, 50 percent of Hungary's reparations payments to the USSR were forgiven by the Russians, effective in 1949, and reportedly, the remaining 50 percent is to be paid only in agricultural produce in order to enable Hungary to use this savings in building up an industrial economy in Hungary. It is also known that reparations payments to Yugoslavia by Hungary had stopped entirely by the first of 1949. Therefore the 22.7 percent allocated to direct and indirect reparations payments in 1948 was dropped in 1949 and pro-rated among the industries of Hungary. Those pro-rated percentages were then applied to an estimated realistic rolling mill production for the years 1949-1952. In reaching total production for those years, consideration was given to present capacity of the Hungarian iron and steel industry, prospects of obtaining installations and equipment for expansion and to the announced targets for the Five Year Plan for Hungarian industry.

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APPENDIX 2

METHOD AND BASIS FOR ESTIMATES OF TRANSPORTATION ALUMINUM REQUIREMENTS

Railroads

Aluminum is not an indispensable requirement of railroad transport. However, because of its light weight and corrosion resisting properties, aluminum is used on railroads in the United States for roofing, doors, skylights, windows, ventilating ducts, ventilators, and reflectors. Moreover, structural shapes are used for the framing of buildings and other structures including bridge spans as long as 100 feet, light-weight passenger cars, and various types of freight cars. Aluminum alloy roof trusses as well as channels, angles, and I beams have also been used. Finely divided aluminum metal in flake form dispersed in a volatile paint-thinner produces an aluminum paint which furnishes a durable protective coating for steel on bridges, water tanks, and signal towers. Aluminum in an asphalt base provides a heat resistant roof coating. Insulated electrical wire and cable with aluminum conductors for building wires in a branch circuit, for feeder and power circuits, and weather-proof and insulated cable for secondary distribution are also used in the United States.

In the Soviet Union there has been considerable interest in the use of aluminum on the railroads particularly alloys for passenger and freight cars, but no extensive use is known. A Soviet source stated in 1940, that very little aluminum has been used on the USSR railroads except for wire and aluminum protective paint. In the future, it is entirely possible that aluminum will be more extensively used on the Soviet railroads. At the present time, however, no data are available upon which to base a quantitative estimate of railroad aluminum use, although there is probably a small annual requirement.

Motor Transport

The use of aluminum for pistons in trucks and automobiles is well established in the USSR. There apparently is also some evidence that certain types of Soviet vehicles are produced with an aluminum cylinder head, and that aluminum is used for grease cups, covers, and other fittings.

Estimates of military requirements for aluminum include as much as 50 pounds per military truck produced and an additional amount for the repair of vehicles.1/ No Soviet data are available upon which to base an estimate of the amount of aluminum required to produce and repair civilian vehicles. It appears reasonable to conclude, however, that this amount would exceed considerably the small use of aluminum per vehicle produced in the United States during 1939 which was only 4.5 pounds2/ but that the use of aluminum in civilian trucks would be less, on the average, than in military trucks for the latter represent the larger types. Moreover, the use of aluminum in passenger cars will be less than in trucks, and will probably not exceed greatly the use per unit in the United States.

It appears reasonable, therefore, that the use of aluminum in civilian trucks will not exceed 40 pounds per unit including repair parts and that its use in passenger cars will not exceed 5 pounds per unit. Accordingly, the following table shows the estimated annual production of civilian motor vehicles, the estimated unit use of aluminum, and the total requirements for the years 1949-1952 inclusive.

1/ Intelligence Division Report, Dept. of the Army July 1949.
2/ Census of Manufacturers, 1939.

Table 1

ESTIMATED MOTOR TRANSPORT ALUMINUM REQUIREMENTS

	1949	1950	1951	1952
Civilian Trucks				
Production, units 1/	240,000	330,000	420,000	420,000
Metric tons of aluminum, per unit	.01814	.01814	.01814	.01814
Total finished aluminum, metric tons	4,354	5,986	7,619	7,619
Passenger Cars				
Production, units 1/	30,000	40,000	50,000	50,000
Metric tons of aluminum, per unit	..0023	.0023	.0023	.0023
Total finished aluminum, metric tons	69	92	115	115
Total Finished Aluminum				
Metric tons	4,423	6,078	7,734	7,734

Inland Waterways

The use of aluminum in the production of pistons and cylinder heads for certain types of Diesel engines for river boats is well established, and it appears that there should be some use of aluminum for fittings on vessels. Some aluminum alloys may also be used structurally in vessels although this possibility cannot be confirmed.

It has been impossible to obtain any data upon which a quantitative estimate of requirements can be based, but in order that some use of aluminum in inland waterway transportation can be reflected, a figure based on one percent of the annual steel requirement for self-propelled river vessels is shown as the inland waterway requirements for aluminum as follows:

Year	Metric Tons of Finished Aluminum
1949	445
1950	466
1951	584
1952	558

Pipe Lines

No evidence has been obtained which indicates a use of aluminum in this industry.

Civil Aviation

The aviation industry is a large consumer of aluminum and the quantities indicated as consumed by Soviet civil aviation have been supplied by the Department of the Air Force.

The aluminum requirements for civil aviation have been computed on the basis of maintaining an inventory of 3,400 aircraft in each of the four years.

1/ See Motor Transport, Petroleum report for basis of production estimates

1949-52. Factors comparable to those used in computing military aircraft requirements for aluminum were used also in the case of civil aviation. The annual production of civil aircraft amounts to some 357 units. The increase in aluminum requirements for 1951 and 1952 is attributable to the estimated increased emphasis on the production of larger type aircraft in those years.

Shipping

The Soviet Union is estimated to be producing 25,000 gross registered tons (GRT) annually and it is further estimated, in the discussion on steel requirements, that 46,500 tons of steel will be needed annually for merchant ship building and repair. For the purpose of a tentative estimate one percent of the steel requirement or 465 tons has been chosen as the annual aluminum requirement. No confidence, however, is reposed in this figure, although it appears in the tables.

Table 2

ESTIMATED KNOWN USSR TRANSPORTATION REQUIREMENTS FOR ALUMINUM

Type of Facility	Unit	1949	1950	1951	1952
Railroads	Metric Tons				
Finished Aluminum	" "	---	---	---	---
Ingot Aluminum 1/	" "	---	---	---	---
Motor Transport					
Finished Aluminum	" "	4,423	6,078	7,734	7,734
Ingot Aluminum 1/	" "	11,639	15,995	20,353	20,353
Inland Waterways					
Finished Aluminum	" "	445	466	584	558
Ingot Aluminum 1/	" "	1,171	1,226	1,537	1,468
Pipe Lines					
Finished Aluminum	" "	---	---	---	---
Ingot Aluminum 1/	" "	---	---	---	---
Civil Aviation					
Finished Aluminum	" "	1,293	1,293	1,575	1,575
Ingot Aluminum 1/	" "	3,305	3,305	4,021	4,021
Shipping					
Finished Aluminum	" "	465	465	465	465
Ingot Aluminum 1/	" "	1,224	1,224	1,224	1,224
TOTAL					
Finished Aluminum		6,626	8,302	10,358	10,332
Ingot Aluminum		17,339	21,750	27,135	27,066

1/ Ingot Aluminum tonnage derived by dividing finished aluminum by .38.

APPENDIX 3

PETROLEUM REQUIREMENTS OF SOVIET AGRICULTURE 1949, 1950, 1951, and 1952

USSR Tractor Park

Tractor numbers in the USSR in 1940 were 523,000. 1/ It is estimated that 5,500 tractors were built in 1941 2/, giving the Soviets 528,500 tractors at the time the Nazis invaded the USSR.

It has been reported that 137,000 tractors were lost to the enemy 3/, leaving 391,500 tractors in the hands of the Soviets. It is assumed that 30 percent of the remainder disappeared from use by 1949 because of complete wearing out and also because of cannibalization for spare parts. This would leave a total of 274,000 tractors out of the prewar park operating in 1949.

It is estimated that the USSR seized as war booty, requisitioned, or received as reparations 25,000 tractors by the end of 1948.

In addition, 10,000 tractors were received under Lend-Lease and UNRRA. 4/

Domestic production of tractors was resumed in 1945 with a total of 8,700 manufactured in that year 2/; 14,000 in 1946 2/; 29,300 in 1947 2/; 60,000 in 1948 5/; and a projected total of 78,000 in 1949 5/. However, not all of the 1949 produced tractors will be used in field operations during the entire year and will not consume an annual requirement of petroleum products. It is estimated that the petroleum used by tractors produced in 1949 will be equivalent to the total annual consumption by 31,000 tractors.

Thus a total of 452,000 tractors in full-time use in 1949 is indicated. It is estimated that the number will increase in 1950 to 464,000 tractors; in 1951 to 473,000 tractors; and in 1952 to 500,000 tractors. See Table I for details.

Horsepower of Tractor Park

The total horsepower of the 523,000 tractors in 1940 was 10,260,000, or an average of 19.6 horsepower per tractor. The Five Year Plan calls for a total tractor production of 325,000 units during 1946-1950, with a total power amounting to 10.8 million horsepower 2/.

Despite the fact that the number of tractors in 1949, 1950, 1951, and 1952, is less than in 1940 the total horsepower will be above prewar, or nearly 11.0 million horsepower in 1949 and 15.5 million horsepower in 1952 as compared with nearly 10.3 million horsepower in 1940. The Soviet tractor industry is gradually increasing the average horsepower per tractor so that the planned 1946-1950 production of 325,000 tractors will have an average of 33 horsepower per tractor. See Tables II, III, IV, and V for details by years.

1/ Sotsialisticheskoe Selskoe Khozyaistvo, 1947, No. 8, p. 11.
2/ OIR Report No. 4704, July 21, 1948, entitled "Draft Power in Soviet Agriculture", Department of State.
3/ Voennaya Ekonomika SSSR v Period Otechestvennoi Voyni, by N. Voznesensky, Moskva, 1947, p. 160.
4/ See Twenty-First Report to Congress on Lend-Lease Operations, for the Period Ended September 30, 1945 and also United States Exports of Domestic and Foreign Merchandise, Report No. FT 410, Section H, Group 7, 1946 and 1947, Bureau of the Census, Department of Commerce.
5/ CIA estimate.

Petroleum Consumption by Tractors

In 1940, 523,000 tractors with 10,260,000 horsepower consumed 5.9 million metric tons of petroleum products, or 0.575 ton per horsepower 6/

Assuming that 80 percent of the total horsepower of the postwar tractors was in Diesel-consuming tractors, then the following breakdown of horsepower in 1949, 1950, 1951, and 1952 by Diesel-consuming and other fuel-consuming tractors is indicated:

Year	Horsepower of Diesel Consuming Tractors	Horsepower of Tractors Consuming Other Petroleum Products	Total Horsepower
1949	3,546,000	7,417,000	10,963,000
1950	5,698,000	6,535,000	12,233,000
1951	8,154,000	5,448,000	13,602,000
1952	10,934,000	4,574,000	15,508,000

Very little diesel fuel in proportion to other fuels was consumed by Soviet tractors in prewar days. It is safe to assume that the 0.575 metric ton of petroleum consumed per horsepower by the Soviet tractor would also apply to the 20 percent of postwar production in non-Diesel tractors as well as in tractors left over from prewar, tractors obtained by requisitions, reparations, and from UNRRA and Lend-Lease.

Both US and Soviet experience has shown that the diesel fuel requirements per horsepower hour on full or near full load is about five-sixths that of kerosene (the common tractor fuel in prewar USSR) 7/. This would indicate that the factor 0.575 metric ton of petroleum should be reduced by one-sixth or 17 percent in order to arrive at a weight of Diesel fuel required per horsepower of Diesel tractors. This means 0.477 metric ton of Diesel fuel per horsepower.

The following petroleum consumption for 1949, 1950, 1951, and 1952 is thus indicated:

6/ Fuel consumption and breakdown for 1937 and 1940 is estimated in R & A No. 2516, Domestic Consumption of Petroleum Products in the USSR, 1945-1952, and cites as references: Wassilief, Soviet Oil Industry in 1938, in 1939 and in the First Six Months of 1940: COI(OSS) Report No. 58, "The Effect of Territorial Losses on Russia's Petroleum Position", 20 May 1942, pp. 27-29.

7/ See "O Tipakh Traktorov v Selskom Khozyaistve SSSR", by S. P. Matskevich in Sotsialisticheskoe Selskoe Khozyaistvo, No. 12, December 1943.

	1949	1950	1951	1952
A. Horsepower of Diesel-consuming Tractors (HP)	3,546,000	5,698,000	8,154,000	10,994,000
Diesel consumption per horsepower (metric ton)	0.477	0.477	0.477	0.477
Total Diesel fuel required (metric tons)	1,691,000	2,718,000	3,889,000	5,246,000
B. Horsepower of Tractors-consuming Other Fuels (HP)	7,417,000	6,535,000	5,448,000	4,574,000
Consumption of other petroleum per horsepower (Metric tons)	0.575	0.575	0.575	0.575
Total non-Diesel petroleum required (metric tons)	4,265,000	3,758,000	3,133,000	2,630,000
C. Total horsepower of all tractors (HP)	10,963,000	12,233,000	13,602,000	15,508,000
Total petroleum, all kinds, required (metric tons)	5,956,000	6,476,000	7,022,000	7,846,000

The following breakdown of total petroleum requirements for 1949, 1950, 1951 and 1952 is estimated:

	Prewar 6/	1949	1950	1951	1952
		(in millions of metric tons)			
Gasoline	1.2	1.0	1.0	1.0	1.0
Kerosene	4.1	3.0	2.4	1.6	1.1
Diesel oil	0.2	1.7	2.7	3.9	5.2
Lubricating oil	0.4	0.3	0.4	0.5	0.5
TOTAL	5.9	6.0	6.5	7.0	7.8

6/ Fuel consumption and breakdown for 1937 and 1940 is estimated in R & A No. 2516, Domestic Consumption of Petroleum Products in the USSR, 1945-1952, and cites as references: Wassilief, Soviet Oil Industry in 1938, in 1939, and in the First Six Months of 1940; COI (OSS) Report No. 58, "The Effect of Territorial Losses on Russia's Petroleum Position", 20 May 1942, pp. 27-29.

TABLE I. USSR TRACTOR PARK in 1949, 1950, 1951 AND 1952
(in units of tractors)

	1949 1/	1950	1951	1952
Tractors from prewar production	274,000	206,000 2/	124,000 3/	50,000 4/
Tractors obtained by requisitions, reparations, etc.	25,000	23,000 5/	21,000 5/	18,000 5/
Tractors obtained from UNRRA and Lend-Lease	10,000	10,000	10,000	10,000
Tractors produced in USSR 1945 to 1948, inclusive	112,000	112,000	112,000	112,000
Total tractors produced in 1949	--	78,000	78,000	78,000
Total tractors produced in 1950	--	--	88,000	88,000
Total tractors produced in 1951	--	--	--	100,000
Full-use equivalent of tractors produced in specified year	31,000	35,000	40,000	44,000
TOTALS	452,000	464,000	473,000	500,000

1/ See text for explanation of figures.
2/ Assuming a 25 percent disappearance from 1949 to 1950.
3/ Assuming a 40 percent disappearance from 1950 to 1951
4/ Assuming a 60 percent disappearance from 1951 to 1952.
5/ Estimates based on a slight disappearance of the older requisitioned tractors.

TABLE II. HORSEPOWER OF THE 1949 TRACTOR PARK

	Number of Tractors 1/	Estimated Average HP per Tractor 2/	Total Horsepower
Tractors from prewar production	274,000	20	5,480,000
Tractors obtained by requisitions, reparations, etc.	25,000	30	750,000
Tractors obtained from UNRRA and Lend-Lease	10,000	30	300,000
Tractors produced in USSR 1945 to 1948, inclusive	112,000	31	3,472,000
Full-use equivalent of tractors produced in specified year	31,000	31	961,000
TOTAL	452,000	24.3 3/	10,963,000

1/ From Table I.
2/ CIA estimate
3/ Average horsepower of all tractors.

TABLE III. HORSEPOWER OF THE 1950 TRACTOR PARK

	Number of Tractors 1/	Estimated Average HP per Tractor 2/	Total Horsepower
Tractors from prewar production	206,000	20	4,120,000
Tractors obtained by requisitions, reparations, etc.	23,000	30	690,000
Tractors obtained from UNRRA and Lend-Lease	10,000	30	300,000
Tractors produced in USSR 1945 to 1948, inclusive	112,000	31	3,472,000
Tractors produced in 1949	78,000	32	2,496,000
Full-use equivalent of tractors produced in specified year	35,000	33	1,155,000
TOTAL	464,000	26.4 3/	12,233,000

1/ From Table I.
2/ CIA estimates.
3/ Average horsepower of all tractors.

TABLE IV HORSEPOWER OF THE 1951 TRACTOR PARK

	Number of Tractors 1/	Estimated Average HP per Tractor 2/	Total Horsepower
Tractors from prewar production	124,000	20	2,480,000
Tractors obtained by requisitions, reparations, etc.	21,000	30	630,000
Tractors obtained from UNRRA and Lend-Lease	10,000	30	300,000
Tractors produced in USSR 1945 to 1948, inclusive	112,000	31	3,472,000
Tractors produced in 1949	78,000	32	2,496,000
Tractors produced in 1950	88,000	33	2,904,000
Full-use equivalent of tractors produced in specified year	40,000	33	1,320,000
TOTAL	473,000	28.8 3/	13,602,000

1/ From Table I.
2/ CIA estimates.
3/ Average horsepower of all tractors.

In order to apply this factor to the Soviet inland shipbuilding and repair industry, it has been necessary:

(1) To convert estimated production of self-propelled vessels in horsepower to gross tons by assuming that the average vessel built would have a tonnage of 65 gross metric tons, and

(2) To convert estimated production of non-self-propelled vessels in tons of carrying capacity to gross tons by assuming that the gross tonnage of the non-self-propelled vessels would amount to 65 percent of the carrying capacity.

See the Inland Waterway, Steel report for estimates of production.

Civil Aviation

The total KWH requirements shown in Table 3 include the amounts needed for manufacture of aircraft for the civil air fleet only. The amount of electric power consumed in the manufacture of aircraft in the Soviet Union is not known, and so in order to arrive at the requirements shown for Civil Aviation, the Japanese factor of 16 KWH per pound of air frame weight has been used. This factor has been applied to the estimated annual civil air production of 3,816,000 pounds of air frame weight.

Shipping

The total KWH requirements shown in Table 3 include the amounts needed for ship-building and repair. A breakdown of the amount needed for repair as opposed to ship-building cannot be given.

The same factor of electric power consumption per gross ton of shipping launched has been used for merchant shipping as used for the inland waterways.

See the Merchant Shipping, Steel report for estimates on production.

USSR TRANSPORTATION REQUIREMENTS FOR ELECTRIC POWER

Table 3

Type of Facility	Unit	1949	1950	1951	1952
Railroads	Kilowatt hours				
Operation		1,712,947,936	2,319,015,429	3,143,315,682	4,057,748,421
Manufacturing		390,121,568	525,034,148	430,313,404	433,043,884
Total		2,103,039,504	2,844,049,577	3,573,629,486	4,490,792,305
Water Transport	" "				
Operation		59,207,040	83,443,840	111,316,160	138,149,760
Manufacturing		207,750,000	277,000,000	346,250,000	346,250,000
Total		266,957,040	360,443,840	457,566,160	484,399,760
Inland Waterways	" "				
Operation		--	--	--	--
Manufacturing		--	--	--	--
Total		117,803,210	182,087,370	153,965,760	220,732,590
Pipe Lines	" "				
Operation		187,014,218	207,487,431	225,339,309	239,411,529
Manufacturing		8,844,360	9,645,120	5,885,640	5,552,880
Total		195,858,578	217,132,551	231,224,949	244,964,409
Civil Aviation	" "				
Operation		--	--	--	--
Manufacturing		61,056,000	61,056,000	61,056,000	61,056,000
Total		61,056,000	61,056,000	61,056,000	61,056,000
Shipping	" "				
Operation		--	--	--	--
Manufacturing		--	--	--	--
Total		8,450,000	8,450,000	8,450,000	8,450,000
Total Operational 1/		1,959,139,194	2,609,946,700	3,479,972,151	4,435,309,710
Total Manufacturing 2/		667,771,928	872,735,268	847,505,044	845,902,764
GRAND TOTAL TRANSPORTATION 3/		2,713,970,950	3,673,219,338	4,485,891,955	5,510,595,064

1/ Includes only supported operational requirements.
2/ Includes only supported manufacturing requirements.
3/ Includes all supported transportation requirements.

TABLE V HORSEPOWER OF THE 1952 TRACTOR PARK

	Number of Tractors 1/	Estimated Average HP per tractor 2/	Total Horsepower
Tractors from prewar production	50,000	20	1,000,000
Tractors obtained by requisitions, reparations, etc.	18,000	30	540,000
Tractors obtained from UNRRA and Lend-Lease	10,000	30	300,000
Tractors produced in USSR 1945 to 1948, inclusive	112,000	31	3,472,000
Tractors produced in 1949	78,000	32	2,496,000
Tractors produced in 1950	88,000	33	2,904,000
Tractors produced in 1951	100,000	33	3,300,000
Full-use equivalent of tractors produced in specified year	44,000	34	1,496,000
TOTAL	500,000	31.0 3/	15,508,000

1/ From Table I.
2/ CIA estimates.
3/ Average horsepower of all tractors.

TRANSPORTATION

I. Railroads POL Requirements

No current Soviet data are available on the Soviet railroad requirements for POL. Therefore, these data can only be obtained by means of estimates. There are several methods that might be used in arriving at estimates of railroad POL requirements.

The first way that is suggested is using a firm figure of POL consumption for a prewar year and then increasing this figure in 1949, 1950, 1951, and 1952 by the estimated increase in ton-kilometers of freight in these years over the base year. This method is not considered desirable for a number of reasons: (1) A close relationship between ton miles and POL consumption cannot be observed in US transportation statistics; (2) The method presupposes that as ton-kilometers and utilization of equipment increase the use of oil burning locomotives will be increased proportionately; and (3) As locomotives are added to inventory, the same relationship between coal and oil burning locomotives will be maintained. The method has merit only in an estimate of the consumption of lubricating oil and grease which represents only a small percentage of the total consumption of POL.

A second method that might be used is applying experienced POL utilization factors such as tons of POL per ton-kilometer and passenger kilometer of traffic. Such experience factors are not available for the USSR, and although they are available for the United States, the US factors cannot be applied to the USSR, because knowledge of the utilization of oil burning equipment (i.e., the number of ton-kilometers and passenger kilometers produced by Diesel and oil burning locomotives as compared with coal burning locomotives) is not available for the Soviet Union.

The third method, while admittedly one of expediency, appears to be the only one that can be used on the basis of information currently available on Soviet railroads. This method is based on evidence that the use of oil for motive power fuel has not and is not being emphasized on the Soviet railroads. In 1938, a Soviet source stated that up to 90 percent of the total fuel consumed on the railroads was hard mineral fuel. 1/ The author goes on to warn that, in the future, the expenditure of mazut fuel will be cut sharply and more and more will the use of coal increase. This is, it is stated, in full compliance with the instructions of the party and of the administration on the conversion to local types of fuel. 2/ Moreover, in 1945, it was announced that the use of local fuels and products is a feature of Soviet railroad operations. 3/

1/ Material Supply, A. V. NAUMOV, Volume II, Moscow, 1938, page 238.
2/ Op. Cit.
3/ Stakhanovite Methods for the Economizing of Fuel, L. G. Murzin and I. P. Feldman, Moscow, 1945, page 3.

Depending upon the availability of local supplies, the railroads of the Soviet Union can burn coal, oil, and wood. The areas in which it is expected that most oil fuel is consumed are the Caucasus and Central Asia. Both coal and oil are used for fuel in the steam locomotives operated on the Caucasus railroads. Coal is used principally in the north and fuel oil in the Transcaucasus. Diesels have also been reported in the Caucasus, and are used because of the difficulties of the water supply and the poor quality of immediately available coal. Possibly from Prokhladnaya south and east in the Turkmen, Uzbek, Kazakh, Tadzhik, and Kirgiz republics south of the 48th parallel are the other areas in which oil burning rail traction is employed.

In conformity with the Soviet practice of holding to a minimum the quantity of petroleum consumed on the railroads, it seems that the modern types of locomotive, notably the JS passenger locomotive and the FD freight locomotive have not been designed as oil burners, but possibly the Consolidation lend-lease freight locomotive, the L 4-6-2, passenger locomotive, E 0-10-0 freight, the new Pobeda, and the O and Y 0-80 locomotives burn oil when used in the area indicated above. 1/

Information on the total number of kilometers of track on which oil burning locomotives are used is conflicting. However, it appears that 7000 kilometers may have been devoted to oil traction in 1940. This would be 7 percent of the 105,000 kilometers of through route in operation in that year. About 6 percent of the 118,000 kilometers of railroad lines planned for 1950 may be used by oil burning locomotives. Nevertheless, the number of kilometers of track respectively devoted to Diesel and to fuel oil traction is not known, and the amount of traffic planned or carried over oil burning routes is not available.

Under the circumstances the most desirable method of determining the quantity of oil burned by the railroads consists of relating the percentile consumption of petroleum products to the percentile consumption of coal and wood. The following table shows the percentage relationship in the consumption of the various types of fuel: 2/

Table 1.

PERCENTILE RELATIONSHIP OF RAILROAD FUEL CONSUMPTION

	Year			
	1913	1933	1940	1943
Fuel	%	%	%	%
Coal	(44	(74	84.6	64.5
Lignite	(	(	6.3	17.2
Oil	38	24	8.1	6.8
Wood	18	2	1.0	11.5

1/ JANIS, 41, Section VII, page 8 and page 16; Table VII-7; page 17; Table VII-8. Handbook on USSR Railways Volume III page 5 and ff. 25X1X7 USFA-BWR #52 of 14 Nov. 47.

2/ Embassy Moscow cable, 31 July 1944; Handbook on USSR Railroads. [redacted] a figure of 93 percent for coal, 6 percent for oil, and 1 percent for wood consumption "before the war" is used. This is related to 1940, but may refer to some other prewar year or even part of a year. Further "93 percent coal" is an ambiguous term since the type of coal is not known. Separating out the lignite and employing an average of about 14,000 BTU for coal to 19,000 BTU for oil, a ratio of 1.3 has been used as a conversion factor for oil from hard coal.

25X1X7

The percentages in Table 1 total 100 percent for each year described and refer to the total caloric fuel consumption on the railroads. In 1940, 93.5 percent of the total coal consumed by all forms of transportation was used by the railroads. 1/ The total consumed by transportation was 49 million tons. 2/ Therefore, 45.8 million metric tons of coal were consumed by railroads in 1940, and this amounted to 90.9 percent of the total amount of fuel consumed by the railroads. Of this amount, 45.8 million metric tons of coal, 42.6 million metric tons are hard coal types and 3.2 million metric tons are lignite. Converting the lignite into hard coal, the total hard coal would amount to 44 million metric tons. 3/ Since 90.9 percent of the total fuel consumed amounted to 44 million metric tons of hard coal, we derive 48.4 million metric tons as the total (100 percent) fuel consumption in 1940 in terms of hard coal. 8.1 percent of this amounts to 3.92 million metric tons of oil expressed in hard coal units. Using 1.3 as a conversion factor from hard coal to oil, a total oil consumption on the railroads of 3.01 million metric tons is obtained.

In 1949, and so far as can be observed for 1950, the increased traffic production is largely being effected by the increased production of coal burning locomotives although there is a small but growing production of Diesel-electric units. The Diesel-electric locomotives are being used, however, in those areas that currently use oil-burning steam locomotives and it appears reasonable to assume that the less efficient oil-burning units will be retired as Diesel-electric locomotives become available, so that there will be no appreciable change in the railroad POL fuel requirements during the years 1949-1952.

The over-all fuel requirements for the railroads, therefore, will be affected only by the small quantity of petroleum products needed for lubricants. A Soviet source states that 28 kilograms of grease are allowed per run of 220 kilometers, and that during a month a locomotive makes no less than 12 trips. 4/ Unfortunately, the kind of grease used is not made clear, nor is it made clear whether the 28 kilograms includes lubricants for the cars as well as the locomotives. At 12 trips per month, which appears low, the annual consumption of lubricants would amount to 4.08 metric tons per locomotive. Multiplied by the estimated serviceable locomotive inventories for the years 1949-1952, the following metric tons of lubricants are required: 5/

1949	1950	1951	1952
104,224	111,184	118,740	125,599

1/ Ugol XII, 1940.
2/ SID, USSR, Volume II.
3/ 25X1X7 [redacted]
4/ The Agitator's Notebook #33.
5/ These figures are partially substantiated by U.S. experience. Taking the average consumption per ton and passenger kilometer of grease, lubricating oil, and kerosene by the U.S. railroads during the period 1940-46, and applying it to Russian traffic statistics for 1950, 124,327 metric tons of these products will be required to carry the planned traffic. Although the railroad system of the USSR and of the US operate under vastly different conditions in the matter of lubricants per ton-kilometer and per passenger kilometer, they are roughly comparable.

2. Motor Transport

In order to determine the POL requirements for the civilian motor transport industry for any given year it is necessary to estimate a mid-year serviceable inventory of civilian motor vehicles, and apply to that inventory the estimated utilization of each vehicle and the POL requirement for the estimated utilization.

A mid-1949 serviceable inventory of all trucks1/ was derived by combining postwar production data (745,000 vehicles, 670,500 trucks, See Appendix A) with an estimated 110,000 serviceable prewar or lend-lease vehicles.2/

The military inventories of trucks 1949-1952 has been estimated by the Intelligence Division, Department of the Army. These inventories do not distinguish between serviceable and unserviceable military vehicles, consist entirely of gasoline trucks and do not include any passenger or staff cars. However, from these estimates it is possible to arrive at a midyear 1949 inventory of 418,607 military gasoline trucks.

The midyear 1949 inventory of all serviceable trucks, mentioned above, has been converted to an inventory of all trucks on the basis that 65 percent of the total inventory represents serviceable trucks.3/ Therefore the mid-1949 inventory of all trucks amounted to 1,185,380 vehicles. The military inventory for mid-1949 was subtracted from the total inventory at mid-1949 in order to arrive at an estimate of the number of trucks in the civilian economy.4/ This amounts to 498,405 serviceable civilian trucks in mid-1949.

In arriving at the 1950, 1951, and 1952 midyear civilian inventories, no further attention was paid to the military inventories except to allocate 30,000 gasoline trucks yearly from new production, as estimated to be required by the Intelligence Division. Midyear serviceable civilian inventories for 1950, 1951, and 1952 were built up by taking all truck production except the 30,000 mentioned previously. All prewar and lend-lease vehicles were retired by mid-1950. One half of 1945 production was retired by mid-1951 and the balance of 1945 production and one half of 1946 production was retired by mid-1952. (See Table 2 Appendix B). The serviceable civilian inventory of trucks includes all Diesels produced, as the estimates of military inventories do not include such vehicles.

Serviceable passenger car inventories were built up on substantially the same basis as trucks except that no passenger cars were assigned for military use for the reason given. Ten thousand prewar and lend-lease motor cars plus postwar production was estimated to be the serviceable inventory by mid 1949. The prewar and lend-lease vehicles were retired by mid-1950. One half of 1945 production was retired by mid-1951 and the balance of 1945 production and one half of 1946 production was retired by mid-1952. (See Appendix A and Table 2 Appendix B).

Having obtained the average serviceable inventories for the years 1949, 1950, 1951, 1952, POL requirements were estimated on the basis of an average utilization of 20,000 miles per vehicle per year for trucks 5/ and 10,000 miles per vehicle per year for passenger cars 6/ and a weighted average fuel consumption of 7 miles per gallon for gasoline trucks, 6.4 miles per gallon for Diesel trucks, 15 miles per gallon for light passenger cars and 10 miles per gallon for heavy passenger cars 7/. Consumption of lubricating oil and grease was computed on the basis of 5 percent of the gasoline and Diesel oil requirement by weight 8/. See Table 3, Appendix B, for POL requirements for the years 1949, 1950, 1951, and 1952.

Footnotes

1/ A reliable estimate of the number of passenger buses is not available. The Soviets plan to produce 425,000 trucks in 1950 and 6,500 buses. The latter is 1.5 percent of the former, and this appears to be a reasonable relationship for the inventory.

2/ Serviceable prewar or lend-lease vehicles in mid-1945 are estimated as follows: 65,000 trucks, 2 tons or less, 10.8 miles per gallon of fuel; 33,000 trucks, 2½ or 3 tons, 7 miles per gallon of fuel; 2,000 Diesel trucks, 4 miles per gallon of fuel; 10,000 passenger cars, 10 miles per gallon of fuel. (Based on data taken from D. B. Shimkin, "The Automobile Industry That's Behind the Iron Curtain", as derived from S. A. Akolzin, "Specifications of the Motor-Vehicles of the USSR").

3/ The Soviet truck inventory was estimated at 65 percent serviceable at the end of 1947, "Soviet Rolling Stock and Motor Vehicle Industries", ORE 42-48, 1 September 1948. There is no evidence that this percentage of serviceable trucks has changed materially by 1949.

4/ No distinction has been made between the types of trucks held by the military and those in use by the civilian economy, except that no Diesel trucks have been allocated to the military.

5/ The figure of 20,000 miles per truck was derived as follows:

1. The 1950 plan calls for a freight turnover of 25.4 billion ton-kilometers or 69.5 million ton-kilometers per day.
2. Available to carry this freight will be: 391,701 light trucks (50% of total civilian truck inventory); 352,534 medium trucks (47% of total civilian truck inventory minus 1.3% of total vehicle inventory, or 15,665 buses); and 23,502 heavy trucks (3% of total civilian truck inventory).
3. Assuming that the light trucks carry an average payload of 1 ton, the medium trucks 2 tons, and the heavy trucks 3 tons, a total of 1,167,275 tons may be carried at one time. To produce 69.5 million ton-kilometers per day, each truck must travel 69,500,000 divided by 1,167,275 or 59.5 kilometers per day. In terms of miles this amounts to 36.9 per day, or 13,469 per year.
4. Assuming loaded haulage to be 2/3 of total travel, the figure of 13,469 miles is increased to 20,206 total miles per truck per year and rounded off to 20,000 miles.
5. This figure is supported by data in "Legkye Metally" No. 7 July 1936 which states that motor vehicles operate on an average 125 kilometers per day for 275 working days in a year. Seventy one kilometers represent the average daily loaded movement.

6/ No basis for this estimate. It is purely a judgment figure.

7/ Based on data contained in S.A. Akolzin, "Specification of the Motor Vehicles of the USSR" (Journal of the Auto-Tractor Industry Moscow, 1937, No. 15) and D. B. Shimkin, "The Automobile Industry That's Behind the Iron Curtain". Consumption of Diesel trucks assumed to be same as 5 ton YAZ 200 truck.

8/ These figures are calculated on the basis of 5% of gasoline and Diesel oil requirements by weight. This percentage was selected as reasonable in the light of US experience. For the three years, 1944, 1945, and 1946 US intercity truck and bus operators filing statistics with the Interstate Commerce Commission reported averages of 4.76 miles per gallon of fuel and 327.2 miles per gallon of lubricating oil. In other words, .21 gallons of fuel were used for every .003 gallons of oil, for a ratio of 70 to 1. In terms of metric tons, with one gallon of gasoline weighing 6.2 pounds and one gallon of lubricating oil 7.5 pounds, the ratio becomes 57.8 to 1. The amount of oil used, therefore, represents 1.7% of the total weight of the gasoline. Making allowance for grease consumption and the possible less efficient use of lubricants and grease in the USSR, the use of 5% as the basis of calculation seemed a reasonable estimate.

APPENDIX A 1/ 2/

POSTWAR PRODUCTION OF MOTOR VEHICLES

Year End	Total Vehicles	Total Trucks	Light Trucks	Medium Trucks	Diesel Trucks	Total Passenger Cars	Light Passenger Cars	Heavy Passenger Cars
	(100%)	(90%)	(45%)	(42%)	(3%)	(10%)	(7.5%)	(2.5%)
1945	95,000	85,500	42,750	39,900	2,850	9,500	7,125	2,375
1946	130,000	117,000	58,500	54,600	3,900	13,000	9,750	3,250
1947	170,000	153,000	76,500	71,400	5,100	17,000	12,750	4,250
1948	200,000	180,000	90,000	84,000	6,000	20,000	15,000	5,000
1949	300,000	270,000	135,000	126,000	9,000	30,000	22,500	7,500
Total (1945-49)	895,000	805,500	402,750	375,900	26,850	89,500	67,125	22,375
Total (1945-Mid 49)	745,000	670,500	335,250	307,900	22,350	74,500	55,875	18,625
1950	400,000		180,000	168,000	12,000	40,000	30,000	10,000
1951	500,000		225,000	210,000	15,000	50,000	37,500	12,500
1952	500,000		225,000	210,000	15,000	50,000	37,500	12,500

1/ Based on plant by plant analysis made possible through receipt of a number of intelligence reports on individual plants. The most reliable reports appear to be those which have been supplied by means of interrogating German and Japanese Prisoners-of-War.

2/ In 1950 the estimated 767,737 serviceable trucks in the civilian economy will produce 33,100 ton-kilometers each in carrying the total traffic of 25.4 billion ton-kilometers. If this factor of utilization is extended into 1951 and 1952, and applied to traffic estimates for those years made in proportion to the anticipated increase in the index of gross industrial output, it is found that 847,432 and 918,308 servicable trucks (including busses) are actually required in 1951 and 1952 to carry the traffic. These figures compare with the 1,115,655 and 1,434,405 serviceable trucks which will actually be available in those years, if estimated production is realized. It is not believed that production will be cut to meet the small increase in truck requirements in 1951 and 1952, or that truck utilization will experience a radical decrease. It is suggested, on the other hand, that motor transport traffic may increase out of proportion to the increase indicated by the rise in the index of gross industrial output, and/or that the military may quite possibly take more vehicles from current production than the 30,000 per year indicated here.

TOP SECRET

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APPENDIX B

USSR MOTOR VEHICLE INVENTORY AND CIVILIAN MOTOR TRANSPORT POL REQUIREMENTS

Table 1

USSR MIDYEAR INVENTORY OF SERVICEABLE MOTOR VEHICLES

	July 1 1949	July 1 1950	July 1 1951	July 1 1952
Trucks, 2 tons and under	400,250	542,750	723,875	898,250
Trucks, 2½ and 3 tons	345,900	509,900	678,950	841,700
Diesel Trucks	24,350	32,850	44,925	56,550
Total Serviceable Trucks	770,500	1,085,500	1,447,750	1,796,500
Light Passenger Cars	60,875	89,625	119,812	148,874
Heavy Passenger Cars	23,625	29,875	39,938	49,626
Total Passenger Cars	84,500	119,500	159,750	198,500
Busses 1/				
Total Serviceable Vehicles	855,000	1,205,000	1,607,500	1,995,000

1/ Included with trucks. Estimated to represent approximately 1.5 percent of total.

Table 2

USSR MIDYEAR INVENTORY OF CIVILIAN MOTOR VEHICLES

	July 1 1949	July 1 1950	July 1 1951	July 1 1952
Total Trucks	1,185,380	1/	1/	1/
Total Military Trucks	418,602	439,138	452,152	462,976
Total Civilian Trucks	766,778	1/	1/	1/
Civilian Serviceable Trucks				
Gasoline Trucks	474,055	750,566	1,070,730	1,377,855
Diesel Trucks	24,350	32,841	44,925	56,550
Total	498,405	783,407	1,115,655	1,434,405
Busses	2/	2/	2/	2/
Serviceable Passenger Cars				
Light	60,875	89,625	119,812	148,874
Heavy	23,625	29,875	39,938	49,626
Total	84,500	119,500	159,750	198,500

1/ Not computed. Method used in computing POL consumption does not require this figure.

2/ Included with trucks. Estimated to represent approximately 1.5 percent of total.

Table 3

POL REQUIREMENTS FOR CIVILIAN MOTOR VEHICLES
(Metric Tons)

	1949	1950	1951	1952
Gasoline				
Passenger Cars				
Light 1/	111,401	164,014	219,256	272,439
Heavy 2/	64,969	82,156	109,829	136,472
Total	176,370	246,170	329,085	408,911
Trucks 3/				
Total	3,730,812	5,906,867	7,495,110	10,843,718
Diesel Oil				
Trucks 4/				
Total	249,344	336,384	460,032	579,072
Lubricating Oil and Grease 5/				
Total	207,826	324,471	414,211	591,585
Total POL	4,364,352	6,813,872	8,698,438	12,423,286

1/ Computed on basis of average utilization of 10,000 miles per vehicle per annum at 15 miles per gallon.

2/ Computed on basis of average utilization of 10,000 miles per vehicle per annum at 10 miles per gallon.

3/ Computed on basis of average utilization of 20,000 miles per vehicle per annum at weighted average of 7 miles per gallon.

4/ Computed on basis of average utilization of 20,000 miles per vehicle per annum at 6.4 miles per gallon.

5/ Computed on basis of 5 percent of Gasoline and Diesel oil requirements by weight

3. Merchant Shipping

The sea-going merchant fleet under Soviet registry comprises about 522 vessels of 1,000 gross tons and over. Of this total, 201 are oil-burning vessels, namely, 89 Diesel-powered ships and 112 steamships powered by fuel oil.

In the Caspian Sea there are 119 vessels of more than 1,000 gross tons, 92 of them tankers, 27 freighters. Of the tankers, 21 are Diesel-powered and 71 use fuel oil. Of the freighters, 10 are Diesel-powered and 17 use fuel oil.

In calculating the estimated consumption and requirement of petroleum products by shipping, use was made of records of daily consumption of fuel oil and Diesel oil by tankers and freighters, as recorded for individual Soviet ships. Where no record was available of the consumption record of a specific ship, it was assigned a consumption rate equal to that of a ship of equal tonnage. Consumption was computed on the basis of the actual number of ships in each gross tonnage class, multiplied by the average daily consumption rate of that tonnage class, since consumption rates vary as the tonnage increases.

Days at sea and in port were based on certain actual performance records kept by War Shipping Administration for US freighters, and by the Armed Services Petroleum Board for USNT tankers. An arbitrary reduction of 20 percent in days at sea for freighters, and of 10 percent for tankers was applied to Soviet ships to allow for less efficient operation, especially on loading and discharging, and for poor condition, lack of repair facilities, and the like as compared with US operations.

Days at sea and in port were assumed to be:

(1) Freighters: 160 days at sea; 205 days in port

(2) Tankers: 215 days at sea; 150 days in port

The assumption of CIA that a ship in port consumes 20 percent of the amount of fuel consumed at sea, was used.

It has been estimated that Soviet shipping requirements in 1949 are as follows:

POL REQUIREMENTS

Fuel Oil		
Freighters (deep sea)	734,036	metric tons
" (Caspian)	422,219	" "
Tankers (deep sea)	50,780	" "
" (Caspian)	65,145	" "
Total Fuel Oil	1,272,180	metric tons
Diesel Oil		
Freighters (deep sea)	98,770	" "
" (Caspian)	8,271	" "
Tankers (deep sea)	40,593	" "
" (Caspian)	49,271	" "
Total Diesel Oil	196,905	metric tons
Total deep water requirements	924,179	" "
Total Caspian requirements	544,906	" "
Total Requirements	1,469,085	metric tons

No change in these requirements has been estimated for 1950, but for 1951 and 1952 requirements have been increased slightly (2.9 percent) in order to take into account the increase in ship tonnage estimated for those years.

Total merchant shipping fuel and Diesel oil requirements for the years 1949-1952 in metric tons are as follows:

Year	Diesel Oil	Fuel Oil	Total
1949	196,905	1,272,180	1,469,085
1950	196,905	1,272,180	1,469,085
1951	215,407	1,297,235	1,512,642
1952	215,407	1,297,235	1,512,642

4. Inland Waterways POL Requirements

In order to estimate total POL requirements for the inland waterways, it is necessary to obtain information on the horsepower inventory of the river fleet, the composition of this inventory by types of fuel consumed, the annual number of hours of operation of all self-propelled oil burning vessels, and the fuel consumption per horsepower hour of operation.

Midyear inventories of serviceable vessels have been used in these computations, since a midyear inventory represents the average number of vessels available throughout the year. It has been estimated that the horsepower inventory of the river fleet will be 850,000 at the end of 1949 and 910,000 at the end of 1950. 1/ Midyear inventories for these years may be derived by subtracting 1/2 of the total yearly increment from the end of year inventory for each year, thus giving 820,000 in 1949 and 880,000 in 1950. Similar inventories for 1951 and 1952 may be estimated by applying a factor of utilization established in 1950 to the estimated traffic in 1951 and 1952. 2/

25X1X7

No reliable data are available on which can be based allocation of the total horsepower inventory to coal and oil burning vessels. [redacted]

25X1X7 [redacted] A serviceability of 90 percent of the inventory appears reasonable. 3/

1/ The 1941 total inventory of self-propelled river vessels was estimated at 3600 units and 810,000 horsepower. (Strategic Intelligence Digest, USSR, Volume III, Transportation, p. 1-4). An official Soviet source has claimed that 4000 vessels of all types were destroyed during the war. (River Transport, 31 October 1947) In order to determine the number of self-propelled vessels at the end of the war, the prewar proportion of self-propelled vessels to total vessels was applied to the total vessels destroyed during the war and this number was subtracted from the prewar inventory. Based on the prewar average horsepower per vessel, it appears that in 1945, self-propelled vessels had a total of 610,000 horsepower. The current Five Year Plan calls for an increase of self-propelled river vessels totalling 300,000 horsepower. On the assumption that there will be an increment of 60,000 horsepower annually, the total horsepower inventory at the end of 1949 will be 850,000 and at the end of 1950, 910,000.

2/ It is believed that in 1950 serviceable vessels totalling 792,000 horsepower (midyear inventory) will produce the planned 49.6 billion ton-kilometers, or 62,600 ton-kilometers per horsepower. Assuming a direct relationship between traffic and industrial activity, and applying this factor of 62,600 ton-kilometers per horsepower to the increased traffic anticipated in 1951 and 1952, serviceable fleet inventories for mid-1951 and 1952 are calculated at 857,827 and 929,712 horsepower respectively.

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3/ [redacted]

4/ STD, Op. Cit.

25X1X7 [redacted]

The total serviceable inventory is therefore estimated as follows:

Table I

SERVICEABLE MIDYEAR INVENTORY OF OIL-BURNING RIVER VESSELS

	1949	1950	1951	1952
Diesel horsepower	182,655	196,020	212,312	230,104
Oil-steam "	370,845	397,980	431,053	467,180
Total(75% of entire fleet)	553,500	594,000	643,370	697,284

It is believed that a maximum of 200 days of operation annually is typical for the average river vessel. 1/ A Soviet source states that river boats are in motion 37.2 percent of the time. 2/ Accordingly, the average number of hours of operation, 1786 per self-propelled river boat per year is derived.

The horsepower hours of operation by types of oil-burning vessels are therefore as follows:

Table II

HORSEPOWER HOURS OF OPERATION

	1949	1950	1951	1952
Diesel oil	326,221,830	350,091,720	379,189,232	410,965,744
Fuel oil	662,329,170	710,792,280	769,869,588	834,383,480

Based on data computed from a British Report, 3/ .000312 metric tons of Diesel oil are consumed per horsepower by Diesel river vessels and .000223 metric tons of fuel oil are consumed per horsepower hour by river vessels burning fuel oil. No firm basis exists for the computation of the consumption of lubricating oil and grease. Although this is not a significant figure in the total Soviet POL consumption, for completeness some allowance should probably be made for it. Therefore, 5 percent of the total fuel and Diesel oil consumption has been allocated for lubricating oil and grease for the vessels consuming fuel and Diesel oil. The same amount of lubricating oil and grease consumed per horsepower hour by fuel and Diesel oil vessels has been applied to the horsepower hours produced by vessels burning coal and wood. Accordingly, the lubricating oil and grease consumption of the entire river fleet has been obtained.

The following table presents fuel, Diesel and lubricating oil and grease requirements of the river fleet for the years 1949 through 1952.

Table III

POL REQUIREMENTS OF THE RIVER FLEET
(Metric tons

	1949	1950	1951	1952
Diesel oil	101,781	109,229	118,307	128,221
Fuel oil	147,699	158,507	171,681	186,068
Lubes and grease	16,608	17,823	19,304	20,922
TOTAL	266,088	285,559	309,292	335,211

1/ N. N. Baranskiy, Economic Geography of the USSR, 8th ed. Moscow, 1947, page 63.

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2/ An Inquiry Into the Economics of Railroad Transportation, Moscow, 1948.

25X1X7 3/ [redacted]

5. POL Requirements, Pipelines

The POL requirements for pipeline operation is based on the assumption that 50 percent of the pipelines are oporated by Diesel power at 50 percent capacity 100 percent of the time.

To determine the Diesel fuel requirement the factor .000312 tons per horsepower hours 1/ was applied to 25 percent of the horsepower hour requirements, estimated as described on Page A4 - 3.

POL REQUIREMENTS, PIPELINES

		Midyear Mileage	Pumping Stations			Hphr. (25% total)	Diesel Fuel (metric tons)
			No.	Av. Hp.	Total Hp.		
1949	Oil	7,430	92.9	895.6	83,204	182,466,346	56,929
	Gas	1,192	14.9	2,087.7	31,108	68,220,028	21,285
	Total						78,214
1950	Oil	8,082	101.0	906.7	91,573	200,818,910	62,655
	Gas	1,307	16.3	2,140.3	34,888	76,509,760	23,872
	Total						86,527
1951	Oil	8,597	107.5	913.5	98,196	215,342,949	67,167
	Gas	1,428	17.9	2,188.6	39,177	85,914,833	26,806
	Total						93,993
1952	Oil	8,933	111.7	917.7	102,509	224,801,282	70,138
	Gas	1,549	19.4	2,240.5	43,466	95,319,905	29,741
	Total						99,879

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1/ [redacted]

6. Industrial Requirements

Combining the Manufacturing and Mining Industry, industrial consumption of petroleum products in 1949, 1950, 1951, and 1952 are largely estimated on the basis of the 1937-1940 trend of petroleum consumption by industry, on the one hand, and the estimated trend of industrial consumption in the postwar period.

From 1937 to 1940, consumption of petroleum products by industry increased by approximately 19.2 percent, i.e., 4.76 million metric tons in 1937 1/ to 5.68 million metric tons in 1940. 2/ While industrial consumption of petroleum products increased in tonnage during the 1937-40 period, Industry consistently accounted for approximately 23 percent of the total annual petroleum consumption when made relative to the other major categories of consumers.

The 1950 goals for plant equipment call for an increase of about 40 percent over the 1940 levels. Since present productivity has not yet reached the 1940 rates in many industries, it is highly unlikely that the Plan will come near attainment.

Assessment of the postwar activity level in industry is exceedingly difficult, with only meager and intangible evidence available. Rather than apply an arbitrary increase in the rate of activity in Industry to petroleum consumption, it is estimated that petroleum consumption will be approximately the same as in 1940, namely 5.6 million metric tons.

Consumption of roughly 1.1 million tons of oil by Power Stations was incorporated together with Manufacturing and Mining under Industry. 3/ In subsequent years, it appears that the relative importance of coal and the generation of electricity increased, while that of fuel oil decreased. As such, the total consumption of petroleum products by the Mining and Manufacturing Industry together with Electric Power Industry is estimated to be 6.7 million metric tons in 1949. Again, it was found that Industry accounted for 23 percent of the total estimated petroleum consumption by the Soviet economy.

Consumption in 1950, 1951, and 1952 was estimated by assigning to Industry 23 percent of the total annual petroleum consumption for each of the years. It is believed logical to make the assumption that Industry will continue to account for 23 percent of the total consumption as was the case in 1937-40, and 1949.

7. Home Use Requirements

In estimating the postwar consumption of kerosene and fuel oil by home use, it was assumed that domestic burning oil light oil is used principally by the urban population for heating purposes and that kerosene was used chiefly by the rural population for lighting and cooking purposes.

Home use consumption of light fuel oil increased more rapidly than consumption of kerosene in the postwar period, reflecting continuation of the trend toward greater urbanization in the Soviet Union. Also, more extensive use of kerosene is likely to be offset by increased rural electrification and natural gas will probably be more widely used in the cities than before the war. Nevertheless, rural electrification and natural gas is expected to eliminate the consideration of kerosene. In view of the Soviet

1/ COI (OSS) Report #58. "The Effect Of Territorial Losses on Russia's Petroleum Position", 20 May 1942. This report used the following Soviet publication for its estimate: Planovoye Khozyaistvo, 1937, No 2, p. 34.
2/ See Table A2, footnote i, R & A No. 2516, 30 April 1945, p. 20.
3/ [redacted]

25X1X7

policy to maintain a relatively high state of military preparedness, it is believed that the Soviet government will expend further effort in restricting civilian home consumption of kerosene and fuel oil. Therefore, consumption in 1949 was probably no greater than the total allocated in 1940, namely 2.7 million metric tons. 1/ A slightly greater availability of kerosene and fuel oil to home use has been shown to compensate to some degree the trend toward greater urbanization in the USSR.

Home consumption is expected to increase slightly in the period 1950-1952, but will decline in relation to the percentage distribution of petroleum products to the Soviet economy.

8. Military Requirements of Refined Products

Soviet military requirements of refined products for the period being considered have been prepared by the Department of the Navy, ONI, and the Intelligence Division, War Department General Staff. The summation of these requirements are shown on Tables VIa, VIIa, VIIIa, and IXa.

1/ Prewar Consumption:

1937 - 2.3 million metric tons (10.3% of total consumption)
1940 - 2.7 million metric tons (9.8% of total consumption)
Ref. COI(OSS) Report #58, The Effect of Territorial Losses on Russia's Petroleum Position, 20 May 1942, pp. 28-34, 37-41.

APPENDIX 4

METHOD AND BASIS FOR ESTIMATES OF USSR ELECTRIC POWER REQUIREMENTS FOR TRANSPORTATION

Official Soviet sources state that 6.5 billion KWH will be consumed by all transport in 1950, but the total requirement estimated in this study for that year does not exceed 3.6 billion KWH. The latter figure omits several important transportation uses for electric power, such as urban transport, terminal and yard facilities, equipment manufacture not covered herein such as ties, rails, truck tires, etc., and miscellaneous power losses. Considering these important omissions, the 6.5 consumption estimate appears within reason. Nevertheless, the transportation estimates for electric power requirement must stand as indicated in Table 3, for no support can be found upon which to base a quantitative estimate of the electric power requirement for the omitted items. Therefore, in any consumption pattern or over-all estimate of electric power, the requirements for the omitted items must necessarily be included in a general requirement for industrial use.

In view of this consideration, it appears desirable that all electric power included in the supported figures appearing in Table 3 which could properly be classified as industrial uses, be separated from the indicated transportation use, and that the transportation requirements for electric power include only operational uses, such as the amount needed for the operation of trains and repair (as opposed to manufacture), of rolling stock.

The following table shows all supported transportation use of electric power, and the supported transportation use when such items as manufacturing (industrial use) are omitted:

Table 1

SUPPORTED TRANSPORTATION REQUIREMENT FOR ELECTRIC POWER

	1949 KWH	1950 KWH	1951 KWH	1952 KWH
Total Supported Transportation Use	2,713,970,950	3,673,219,338	4,485,891,955	5,510,395,064
Transportation Use Excluding Manufacturing 1/	1,959,139,194	2,609,946,700	3,479,971,151	4,435,309,710

Railroads

The total KWH requirements shown in Table 3 include freight operation, passenger operation, repair of motive power and rolling stock, and manufacturing.

The amount of electric power needed for the railroad has been computed as follows:

1. Freight Operation

A Soviet source, B. Levin, "Basic Problems of the Five-Year Plan," states that 76.3 billion gross ton-kms of freight are planned for the electrified railroads in 1950 and that .018 KWH are allowed for the production of

1/ Does not include KWH needed for repair of merchant shipping and river vessels for reason explained in text following.

one gross ton-kilometer. The KWH necessary for this traffic has been adopted as the requirement for 1950. Changes in this requirement for 1949, 1951, and 1952 have been based on the estimated inventory of electric locomotives in those years as compared with 1950.

2. Passenger Operation

The number of KWH required for each year is based on the planned relationship of electric passenger traffic to freight traffic as set forth in "Basic Problems of the Five-Year Plan for Railroad Transport, 1946-1950."

3. Repair of Locomotives and Cars

It is estimated that ten percent of the inventory of locomotives and cars requires heavy repairs annually, and that the amount of electricity required for this operation will be substantially the same as that required for the building of locomotives and cars. A US factor of 89,123 KWH per locomotive and 4,026 KWH per car has been applied to the total number of locomotives and cars estimated to be repaired annually.

4. Manufacturing

The US factors mentioned in (3) above were applied to the total number of locomotives and cars estimated to be produced annually. This factor was obtained from the Census of Manufactures, 1939.

See the Railroad, Steel report for estimates of inventories and production.

Motor Transport

The total KWH requirements shown in Table 3 include the amounts needed for manufacturing and repair of motor vehicles. A US factor taken from the Census of Manufactures, 1939, amounting to 692.5 KWH for each motor vehicle produced was applied to estimated production of motor vehicles in 1949, 1950, 1951, and 1952 to obtain the manufacturing requirement for motor transport.

The amount of electric power needed for the repair of motor vehicles was obtained by estimating that ten percent of the total inventory of vehicles would be subjected to heavy repair during the years in question, and that the electric power required per unit would amount to the same as for manufacturing.

See the Motor Transport, Petroleum report for estimates of inventories and production.

Pipelines

The total KWH requirement shown in Table 3 includes the amount needed for manufacturing of pipeline equipment and for the operation of pumping stations.

The electric power requirement for the manufacture of pipe was derived by applying the factor of 120 KWH per ton to the yearly tonnage requirement for pipelines. This factor was obtained from the Census of Manufactures, 1939.

Horsepower requirements for pumping were estimated through the use of the formula $Hp = \frac{1.7 \times Q \times P}{\text{Efficiency}}$ where "Q" represents capacity in thousands of barrels per day and "P" pressure in hundreds of pounds per square inch. Capacity of lines in operation on 1 January 1949 was computed by taking a weighted average diameter of those lines, 11.3 inches in the case of oil lines, and 16.2 inches for gas lines, and accepting standard capacities for pipes of those diameters: 43,680 barrels of oil per day for the 11.3 inch and 612,360,000 cubic feet of gas per day for the 16.2 inch. The latter was converted to 102,060 barrels per day on the basis of 6,000 cubic feet per barrel, taken from "Petroleum Data Book, 1948." Capacities of lines built after 1 January 1949 were similarly calculated on the assumption that the oil lines will average 12 inches and the gas lines 18 inches in diameter.

Pressures of 960 pounds per square inch (p.s.i.) with pressure losses of 12 p.s.i. per mile were used for both types of lines, such pressure being required to produce the capacities indicated. Pumping stations, therefore, were estimated to be an average of 80 miles apart, and their efficiency was rated at 80 percent in accord with United States experience.

Mileage of lines added after 1 January 1949 was estimated on the assumption that lines reported under construction on that date will be completed by the end of 1950. For the years 1951 and 1952 gas line construction was projected at the same rate as that established in 1950, and it was assumed that oil line construction would proceed at a rate which would see the completion by the end of 1952 of all lines reported as of 1 January 1949 as being planned.

Horsepower-hours were estimated by assuming 8760 hours of operation per year, and the amount of electric power required was determined by the application of the factor .746 to 25 percent of the horsepower hour requirements. (1 kwhr = 1.34 hphr.)

Calculations were made on the basis of midyear pipeline mileage, which in each case was taken to represent the average mileage in operation throughout the year.

See the pipeline, Petroleum report for additional pertinent data, and following table:

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Table 2

ELECTRIC POWER REQUIREMENTS, PIPELINES

Operation (50 percent capacity)

1949	Midyear Mileage	Pumping Stations No.	Pumping Stations Av. Hp.	Pumping Stations Total Hp.	Hphr (25 percent total)	Kwhr Required
Oil	7430	92.9	895.6	83,204	182,466,346	136,119,949
Gas	1192	14.9	2087.7	31,108	68,220,028	50,894,269
Total						187,014,218
1950						
Oil	8082	101.0	906.7	91,573	200,818,910	149,810,690
Gas	1307	16.3	2140.3	34,888	76,509,760	57,676,741
Total						207,487,431
1951						
Oil	8597	107.5	913.5	98,196	215,342,949	160,645,655
Gas	1428	17.9	2188.6	39,177	85,914,833	64,693,654
Total						225,339,309
1952						
Oil	8933	111.7	917.7	102,509	224,801,282	167,700,961
Gas	1549	19.4	2240.5	43,466	95,319,905	71,710,568
Total						239,411,529

Manufacture

	1949	1950	1951	1952
Oil pipe (Kwhr)	7,108,320	7,752,600	3,993,120	3,660,360
Gas pipe (Kwhr)	1,736,040	1,892,520	1,892,520	1,892,520
Total (Kwhr)	8,844,360	9,645,120	5,885,640	5,552,880

Total Kwhr Required

	1949	1950	1951	1952
Operation	187,014,218	207,487,431	225,339,309	239,411,529
Mfg.	8,844,360	9,645,120	5,885,640	5,552,880
Total	195,858,578	217,132,551	231,224,949	244,964,409

Inland Waterways

The total KWH requirements shown in Table 3 include the amounts needed for manufacturing and repair of vessels. A breakdown of the amount needed for repair as opposed to manufacturing cannot be given.

This estimate was obtained by applying a very rough US-experienced factor of 338 kilowatt hours for each gross ton launched. The factor was developed from data taken from the Census of Manufactures, 1939, which includes the total kilowatt hour consumption for shipbuilding and repair and the total gross tons launched for the comparable period.

In order to apply this factor to the Soviet inland shipbuilding and repair industry, it has been necessary:

(1) To convert estimated production of self-propelled vessels in horsepower to gross tonsby assuming that the average vessel built would have a tonnage of 65 gross metric tons, and

(2) To convert estimated production of non-self-propelled vessels in tons of carrying capacity to gross tons by assuming that the gross tonnage of the non-self-propelled vessels would amount to 65 percent of the carrying capacity.

See the Inland Waterway, Steel report for estimates of production.

Civil Aviation

The total KWH requirements shown in Table 3 include the amounts needed for manufacture of aircraft for the civil air fleet only. The amount of electric power consumed in the manufacture of aircraft in the Soviet Union is not known, and so in order to arrive at the requirements shown for Civil Aviation, the Japanese factor of 16 KWH per pound of air frame weight has been used. This factor has been applied to the estimated annual civil air production of 3,816,000 pounds of air frame weight.

Shipping

The total KWH requirements shown in Table 3 include the amounts needed for ship-building and repair. A breakdown of the amount needed for repair as opposed to ship-building cannot be given.

The same factor of electric power consumption per gross ton of shipping launched has been used for merchant shipping as used for the inland waterways.

See the Merchant Shipping, Steel report for estimates on production.

USSR TRANSPORTATION REQUIREMENTS FOR ELECTRIC POWER

Table 3

Type of Facility	Unit	1949	1950	1951	1952
Railroads	Kilowatt hours	1,712,917,936	2,319,015,429	3,143,315,682	4,057,748,421
Operation		390,121,568	525,034,148	430,313,404	433,043,884
Manufacturing		2,103,039,504	2,844,049,577	3,573,629,486	4,490,792,305
Total					
Motor Transport	" "	59,207,040	83,443,840	111,316,160	138,149,760
Operation		207,750,000	277,000,000	346,250,000	346,250,000
Manufacturing		266,957,040	360,443,840	457,566,160	484,399,760
Total					
Inland Waterways	" "	--	--	--	--
Operation		--	--	--	--
Manufacturing		117,803,210	182,087,370	153,965,760	220,732,590
Total					
Pipe Lines	" "	187,014,218	207,487,431	225,339,309	239,411,529
Operation		8,844,360	9,645,120	5,885,640	5,552,880
Manufacturing		195,858,578	217,132,551	231,224,949	244,964,409
Total					
Civil Aviation	" "	--	--	--	--
Operation		61,056,000	61,056,000	61,056,000	61,056,000
Manufacturing		61,056,000	61,056,000	61,056,000	61,056,000
Total					
Shipping	" "	--	--	--	--
Operation		--	--	--	--
Manufacturing		8,450,000	8,450,000	8,450,000	8,450,000
Total					
Total Operational 1/		1,959,139,194	2,609,946,700	3,479,972,151	4,435,309,710
Total Manufacturing 2/		667,771,928	872,735,268	847,505,044	845,902,764
GRAND TOTAL TRANSPORTATION 3/		2,713,970,950	3,673,219,338	4,485,891,955	5,510,395,064

1/ Includes only supported operational requirements.
2/ Includes only supported manufacturing requirements.
3/ Includes all supported transportation requirements.

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